THE
JOURNAL OF MENTAL SCIENCE
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Part I.—Original Articles.

THE CENTENARY OF THE JOURNAL OF MENTAL SCIENCE.

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THE first number of the *Journal of Mental Science* appeared on 15 November, 1853. It will be noted that we are still in our 99th Volume—the discrepancy is accounted for by changes in the mode of issue during the first few years.

The "Association of Medical Officers of Hospitals for the Insane" had already been in existence for twelve years when the Journal commenced publication, and it might be thought that the new venture was a sign of growing strength. It seems clear, however, that this was not so; membership was still quite small, and only a handful were able to attend the annual meetings; the original practice of a three-day meeting to include a thorough inspection of a mental hospital had been given up, and in fact in 1853 no meeting was held at all. In 1852, however, a meeting had been held at Oxford, and it was here that it was resolved to venture on publication. In the circumstances it was a courageous decision, which was fully justified, for within a few years both the Association and the *Journal* were steadily prospering.

Dr. J. C. (later Sir John) Bucknill was appointed Editor at this meeting. A year elapsed during which "some doubts were felt respecting the amount of literary support which could reasonably be expected from men so preoccupied as the medical officers of asylums," and Dr. Bucknill fortified himself by obtaining promises of support, written and verbal, from as many members of the specialty as could be reached by circular.

Criticism had come especially from Dr. Forbes Winslow, who five years earlier had started an independent *Journal of Psychological Medicine.* This was a quarterly, and in format and size (about 150 pages per number) bore a close resemblance to the later appearance of our own *Journal.* The following extracts will show why Forbes Winslow felt slighted:

"An attempt is now being made to resuscitate a suggestion made last year, at the meeting held at Oxford, in relation to the establishment of a journal in connexion with the Association of Medical Officers of Asylums for the Insane. The editor of this journal is indebted to the courtesy of a friend for a copy of Dr. Bucknill's circular, having reference to this subject. We have a right to ask, why this

circular was distributed to other members of the Association, and carefully withheld from ourselves? Again, how was it that the whole plan of the new journal was conceived, and even its editor selected, before the meeting of the Association last year at Oxford?

"We understand that few members of any influence or status in that Association have responded favourably to Dr. Bucknill's circular. Many distinguished members have distinctly informed us that they have positively refused to write for it, on the ground that a second psychological journal is not needed. We must confess we do not feel ourselves complimented at the suggestion to establish a periodical of the kind. Our pages have always been open to the communications of the members of the Association, and we have done our utmost to promote its well-being, to advance medico-psychological literature and to support the interest of those connected with the public asylums of this country. Having embarked a capital of some thousand pounds in establishing this journal, and having, since 1848, stood nearly alone in fighting the battle for the British psychologist, it cannot be otherwise than mortifying that those who have never lifted their little finger to assist us, should, in 1853, attempt to injure the property of this journal by starting a rival publication."

Fortunately, as we shall see later, there was a speedy reconciliation, and within four years Forbes Winslow had been elected President of the Association.

The title of the Journal was at first *The Asylum Journal*, and it was published at six-weekly intervals until July, 1855. Each number had 16 pages; the format was "royal 8vo" and the journal was printed in two columns; the price was 6*d*. per copy. These 14 early numbers constitute the first volume. After July, 1855, the format was altered; the Journal became a quarterly; and the title was altered to *The Asylum Journal of Mental Science*, and later to *The Journal of Mental Science*.

We may now glance at the contents of the first number, which was as follows:

The Asylum Journal, No. 1, 1853.

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The Journal, then, begins with a "Prospectus," by Dr. Bucknill, and its opening paragraphs should be quoted:

"From the time when Pinel obtained the permission of Couthon to try the humane experiment of releasing from fetters some of the insane citizens chained to the dungeon walls of the Bicêtre, to the date when Conolly announced that, in the vast Asylum over which he presided, mechanical restraint in the treatment of the insane had been entirely abandoned, and superseded by moral influence, a new school of special medicine has been gradually forming.

"That period which is marked in the annals of France as the Reign of Terror saw the star of hope arise over the living sepulchre of the lunatic. Pinel vindicated the rights of science against the usurpations of superstition and brutality; and rescued the victims of cerebro-mental disease from the exorcist and the gaoler. But the victory was not gained in one battle; the struggle was carried on with undulating success, until in this country the good work was definitely consummated by the labors of Conolly.

"The Physician is now the responsible guardian of the lunatic, and must ever remain so unless by some calamitous reverse the progress of the world in civilization should be arrested and turned back in the direction of practical barbarism. Since the public in all civilized countries have recognized the fact, that Insanity lies strictly within the domain of medical science, new responsibilities and new duties have devolved upon those who have devoted themselves to its investigation and treatment. Many circumstances have tended, not indeed to isolate cerebro-mental disease from the mainland of general pathology; but to render prominent its characteristics and to stamp it as a specialty.

"Since in the so-called psychical mode of cure, one personality has to act upon another, and since in this case the vehicle, as it were, in which the medicine is exhibited is the person of the administering physician himself, this is the first point to be considered. His circumstances (i.e., those of the psychiatric physician) must be such as to allow him to devote himself more or less exclusively to this branch of medicine; that is, to give it the greater portion of his time, which is more necessary in this than in other branches, because the treatment in most instances demands a *second education*. He must be able by his personal demeanour to obtain influence over the minds of other men, which though in fact an essential part of a physician's mode of cure, is a gift that nature often refuses to the most distinguished men, and yet without which mental diseases, however thoroughly understood, cannot be successfully treated.

"The necessity of such exclusive devotion to the study of Insanity, of such a second education, would by itself of necessity constitute diseases of the mind into a strict specialty: and it would be difficult to instance any physician, who has ever become celebrated in the treatment of mental disease, or has written any work of standard authority thereon, who has not previously separated himself from the wide field of general medicine."

Bucknill goes on to explain the steps that were taken towards the foundation of the *Journal*, and sets out its aims and objects:

"The aims and objects of the *Asylum Journal* will be, to afford a medium of intercommunication between men engaged in the construction and management of asylums, in the treatment of the insane, and in all subsidiary occupations; it will therefore embrace topics, not only interesting to medical men, but to visiting justices, asylum architects, and chaplains; nothing will be excluded which is not foreign to the modern system of the care and treatment of the insane. It will be a record of improvements and experiments in psychotherapeutics; whether in medicine, hygiene, diet, employment and recreation; or in the construction, fittings, organization and management of asylums. It will notice new opinions in the physiology of the nervous system, and the neurological observations and discoveries of every kind.

"It is hoped that it will afford a means of conveying to Visiting Justices and others, in whose hands is vested the ultimate authority in the government of asylums, much valuable information respecting their own duties, which has not hitherto reached them through any other channel.

"That the governing bodies of lunatic asylums and hospitals are much in need of some instruction respecting the principles on which their duties should be discharged is sufficiently evident, from the imperfect arrangements both of accommodation and management still to be found in many asylums; from the excessive expenditure which has often been permitted in the architectural department, and the contrasting, but not counteracting, parsimony in matters more immediately affecting the welfare of the patients; from their not unfrequently converting that which should be a hospital, even for patients incapable of perfect cure, into a great Almshouse; from their forgetting that insanity is a disease, and their consequent want of the due appreciation of medical science in its treatment."

The second number contains a summary of the new "Lunatic Asylums Act, 1853," and a note by John Conolly in reply to a German criticism of the "Non-Restraint" system. With this the *Journal* was fairly launched. Subsequent numbers contained much lively controversy between the total abolitionists (of whom the Editor was one) and the defenders of "occasional restraint." There are lengthy reviews of asylum reports and correspondence on a variety of subjects; lawsuits are reported and local scandals exposed; and there is an impressive body of clinical and pathological contributions, which may still be read with profit. To take one example at random, almost the first is one on "The Prevention of Dysenteric Diarrhoea in Asylums," but it is clear that the author is describing a chronic deficiency condition, and his observations and reasoning lead him to prescribe a diet of fresh vegetables and fruit.

The following are extracts from the minutes of the Association's Annual Meeting on 22 June, 1854:

"Dr. Bucknill, then being called upon to make any statement respecting the *Journal*, said . . . that members must judge for themselves of the literary success which had attended the undertaking. . . . From numerous letters . . . he felt that it had given satisfaction. . . .

". . . If he were tempted to make the slightest complaint that he had not been well supported, the number of original papers from different members of this Association, which the *Journal* already contained, would at once refute him. He trusted that Members would continue to supply him with similar communications in increasing numbers, and that they would bear in mind Dr. Conolly's remarks when, at the Oxford Meeting, they determined to establish the *Journal*, that the case-books of asylums contained an unworked mine of golden wealth, which it was their duty to make productive for the public good.

". . . He felt sure that Dr. Forbes Winslow would acknowledge that their *Journal* was conducted in no spirit of rivalry to his own excellent publication; but on the contrary, he hoped that the two might even extend the usefulness of each other.

"The associations of public officers of asylums for the insane had long supported journals devoted to their specialty both in France and America—[Dr. Sutherland: and Germany]—he had forgotten Germany; and he trusted that they experienced some satisfaction in no longer lagging behind the other civilized nations in this respect.

"Dr. Forbes Winslow spoke of the *Asylum Journal* in the most handsome manner. He did not consider it a rival to the *Psychological*, and he begged to move that "The best thanks of this Association be given to Dr. Bucknill, for the manner in which he has conducted the *Asylum Journal*."

Here we may leave the early history of the *Journal*, for this is not the place to chronicle its subsequent career, and a full history of the *Journal* and the Association remains to be written. The list of its nineteenth-century Editors is impressive enough—Maudsley, Lockhart Robertson, Clouston,

Hack Tuke, Savage, Rayner are among them; as Dr. Drury told us in his Presidential Address, they were "great men, fierce and outspoken, with flails and scorpions in their hands." A last word may be said of Bucknill, who brought the *Journal* into being and was solely responsible for it for ten years—and during this time wrote about sixty personal contributions, brought out several books, collaborated in producing the best-known text-book of psychiatry of the period, superintended the Devon County Asylum and organized the Devon Volunteers. His statue may be seen in the grounds of Exeter Castle, but perhaps the ninety-nine volumes of the *Journal* he founded are his true monument.

THE INSANE ROOT.

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND TWELFTH ANNUAL MEETING OF THE ASSOCIATION ON WEDNESDAY 8 JULY, 1953.

By G. W. T. H. FLEMING, M.R.C.S., L.R.C.P., D.P.M.,
Physician Superintendent, Barnwood House, Gloucester.

THE first duty of your President is to say thank you and this I do with great sincerity. To be elected President of this historic association is indeed an honour, and I very much appreciate it.

Having been your Editor-in-Chief for many years it has been my privilege to edit the presidential address each year with due respect to the President, and then correct the galley-proof and the paged proof, so that by the time you read it in the *Journal* I have seen enough of it. Now in my own case, in addition to all this, I have to write it, which, of course, implies choosing a subject. To a President-elect who cares to look through the yearly volumes of the *Journal of Mental Science*, it must soon be apparent that there are very few subjects left untouched, and so he turns in despair to his own imagination. I turned not in despair but with a measure of relief, indeed with a cheerful heart, for I said to myself I will appear to the assembled multitude not as a psychiatrist at all, but as a bibliophile with a botanical bias and a superficial contact with psychiatry, and that to some extent through witchcraft and superstition; indeed you may come to regard me (temporarily I hope) as a mountebank or quack.

I have entitled my presidential address "The Insane Root," quoting Shakespeare's "Macbeth" where Banquo says:

> "Were such things here as we do speak about?
> Or have we eaten of the insane root
> That takes the reason prisoner?"

The insane root, of course, is the mandrake or mandragora, and there are several allusions to it in Shakespeare's plays. In "Antony and Cleopatra" Cleopatra exclaims:

> "Give me to drink mandragora,
> That I might sleep out this great gap of time
> My Antony is away."

In "Othello," Iago remarks:

> "Not poppy, nor mandragora,
> Nor all the drowsy syrups of the world,
> Shall ever medicine thee to that sweet sleep
> Which thou owdst yesterday."

Marlowe in "The Jew of Malta" mentions mandrake, for Barabas on being asked "Didst break prison?" replies:

> "I drank poppy and cold mandrake juice;
> And being asleep, belike they thought me dead,
> And threw me o'er the walls."

Webster in his "Duchess of Malfi" says:

> "Come violent death,
> Serve for mandragora, to make me sleep,"

and again,

> "I have this night digg'd up a mandrake
> And I am gone mad with't."

FIG. 1.—A mandrake plant from the Herbal by Fuchs, *De Historia Stirpium*, Basle, 1545.

What I shall say to you will only be a very small fraction of a very big subject. I shall only scratch the surface, and those of you who are sufficiently interested will find matter for many hours of delightful study if you delve deeper.

The word mandrake is probably derived from the Latin mandragoras, or possibly from the two Sanscrit words mandros, sleep and agora, or substance, the word then meaning the sleep-producing substance. John Parkinson in his *Theatrum Botanicum*, published in 1640, speaks of mandrakes and woman-drakes for the so-called male and female of the plant. The mandrake, *Mandragora officinarum* L., belongs to the potato family, the Solanaceae, and grows mostly in the Mediterranean area. It has a short stem with a tuft of ovate leaves and a thick, fleshy and often branched root. The purple bell-shaped flowers are solitary, and give rise to a fleshy orange-coloured berry. Various parts of the plant were used, the leaves, the rind of the root, the fruit, the root

itself and the juice of the crushed root or fruit, the former being regarded as the more powerful. The mandrake has been used as a narcotic to produce sleep for well over two thousand years, and is mentioned in certain texts on Assyrian clay tablets some seven hundred years before the Christian era. It was originally used for convulsions, for those oppressed with the "black choler" or melancholia, and in the treatment of insanity, mostly with a view to inducing sleep. At the same time the drug caused mental symptoms, so that Hippocrates advises "administer less of the drug than causes madness." Macrobius refers to it as a remedy for insomnia. It was also used as an anodyne, the heavy stupor which was induced rendering the person insensible to pain,

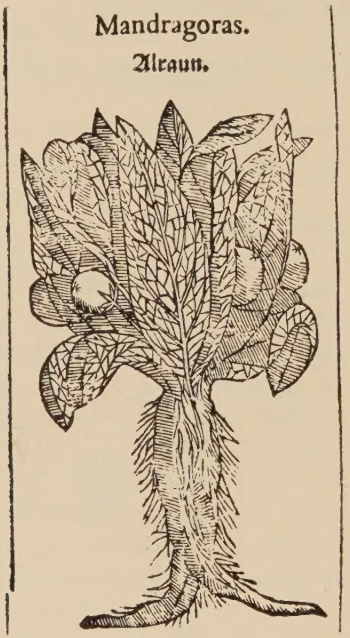

FIG. 2.—A mandrake plant from the Polish Herbal of Syrennius, Cracow, 1613.

and so it became the first anaesthetic to be used before surgical operations. Pliny goes so far as to say that with some persons the odour of wine of mandragora is quite sufficient to produce sleep. The wine, known as morion or "death wine" is said to have been given in Roman times to those being tortured or subjected to prolonged or painful death. When crucifixion was a Roman punishment it was the custom of women to visit the prisoners on the cross and to administer to them a sponge charged with morion. It has been suggested by Lyman that this "death wine," in which mandragora and myrrh formed ingredients, was the same as that offered to Jesus Christ during his agonies on the Cross. Several writers between the fifth and eleventh centuries state that half an ounce or so of mandragora wine will render a person insensible to the pain of amputation.

The gathering of the mandrake appears to have given rise to considerable difficulties as various superstitions came into play. Folk-lore contains a

number of references to the dangers of gathering different plants, particularly mandrake, and to the ceremonies attached to the gathering.

Shakespeare makes a reference to these in " Romeo and Juliet " :

> " What loathsome smells,
> And shrieks like mandrakes torn out
> of the earth,
> That living mortals, hearing them, run mad,"

and again in " King Henry VI," the lines by Suffolk,

> " Would curses kill, as doth a mandrake's groan
> I would invent as bitter— searching terms
> As curst, as harsh and horrible to hear."

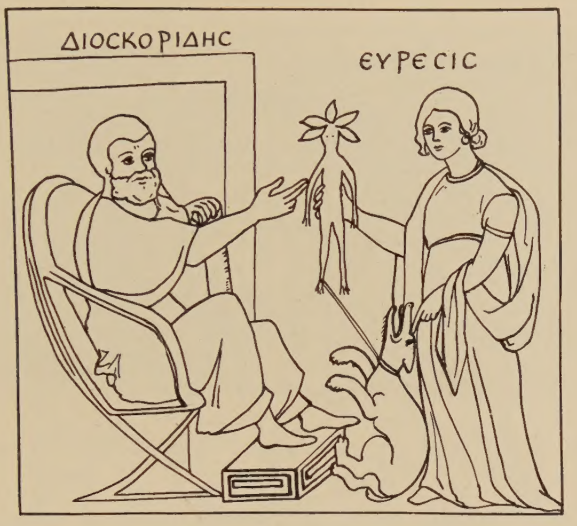

FIG. 3.—Heuresis, the goddess of Discovery presenting Dioscorides with a mandrake; the dead dog is at her feet. From the 6th century "Anicia" MSS of Diocorides in Vienna.

Ben Jonson in his " Masque of Queens " says :

> " I last night lay all alone
> On the ground, to hear the mandrake groan ;
> And plucked him up, though he grew full low
> And as I had done, the cock did crow."

Michael Drayton in his " Nymphal " says :

> " By the mandrake's dreadful groans."

The Arabs called the mandrake the " Devil's Candle," and to the light shown by the plant, Moore alludes in " Lalla Rookh " :

> " Such rank and deadly lustre dwells
> As in those hellish fires that light
> The mandrake's charnel leaves at night,"

and again :

" The phantom shapes—Oh touch them not
That appals the maiden's sight,
Look in the fleshy mandrake's stem
That shrieks when plucked at night."

The light that was supposed to be emitted by the mandrake leaves was due to the glow-worms that settled on the leaves of the plant.

The dangers that were supposed to be inherent in attempting to gather the mandrake were quite obviously due to the belief in devils which lived in the plant and would take the life of the person who tried to dig it up. The belief in devils living in trees and plants was a common one in the Middle Ages, and many ceremonies were devised to protect man by magical means against the evil that would befall him. The mandrake should be gathered by night,

Fig. 4.—Heuresis, the Goddess of Discovery holding a mandrake for an artist to draw it, while Dioscorides writes a description of it in a book. From the 6th century "Anicia" MSS. of Dioscorides in Vienna.

on a Friday or in the month of May. The gatherer should stand with his back to the wind. The making of three magic circles round the plant with a sword was a common practice. Almost invariably a dog was used to up-root the plant ; by this means the anger of the demon was vented on the poor dog, which was killed by the demon. The dog was tempted by a piece of meat after it had been attached to the plant, and in straining to get the meat it uprooted the plant, which screamed, and the dog died on the spot, or at sunrise. The mandrake gatherer was advised to stop his ears with wax so that he should not hear the scream of the mandrake. In some cases the directions for gathering the plant include instructions for washing the root in running water for a day and a night to wash away the devilish taints. The drawing of the circle round the plant before digging it up is thought by some to be derived from the ancient symbol of the serpent with its tail in its mouth.

Apparently a similar ceremony was used in gathering the hellebore, which is stated " soon maketh the head heavy."

John Goodyer between 1652–1655 wrote out an interlinear translation of the *Materia Medica* of Dioscorides. Of mandrake Dioscorides says :

> " But of ye male, and white which some have called Norion, ye leaves are greater smooth as of the beet, but ye apples twice as big drawing to saffron in ye colour ; sweet smelling with a certain strongness which also ye shepherds eating are in a manner made asleep, but ye root is like to that before it. Some do seeth the roots in wine to thirds, and straining it set it up, using a cyathus of it for such as cannot sleep, or are grievously pained and upon whom being cut or cauterized they wish to make a not-feeling pain. Ye juice being drunk ye muchness of ye quantity

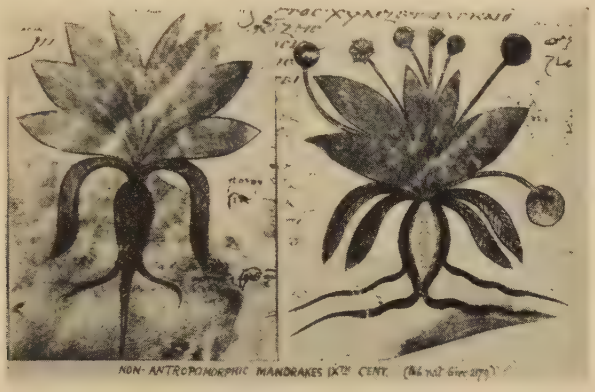

Fig. 5.—Two non-anthropomorphic mandrakes from IXth century manuscripts.

> of two oboli with melicrate, doth expel upward phlegm and black choler, as ellebore doth, but being drunk too much it drives out ye life."

Apuleius Barbarus (not to be confused with Apuleius of 'Golden Asse' fame), wrote a herbal somewhere between A.D. 1000-1050. He had a wide knowledge of herbs and their properties, or " wort-cunning," and in his herbal he writes of mandrake :

> " This wort which is named mandragoras, is mickle and illustrious of aspect and it is beneficial. Thou shalt in this manner take it, when thou comest to it, then thou understandest it by this that it shinith at night altogether like a lamp. When first thou seest its head, then inscribe thou it instantly with iron, lest it fly from thee : its virtue is so mickle and so famous, that it will immediately flee from an unclean man when he cometh to it, hence as we before said, do thou inscribe it with iron and so shalt thou delve about it as that thou touch it not with the iron, but thou shalt earnestly with an ivory staff delve the earth. And when thou seest its hands and its feet, then tie thou it up. Then take the other end and tie it to a dog's neck, so that the hound

be hungry, next cast meat before him so that he may not reach it, except he jerk up the wort with him. Of this wort it is said that it hath so mickle might, that what thing soever tuggeth it up, that it shall soon in the same manner be deceived. Therefore, as soon as thou see that it be jerked up, and have possession of it, take it immediately in hand and twist it and wring the ooze out of its leaves into a glass ampulla or pitcher, and when need come upon thee, that thou shouldst therewith help any man, then help thou him in this manner. For headache and in case that a man may not sleep, take the ooze, smear the forehead, and the wort also in the same manner relieveth the headache, and also thou wondrest how quickly the sleep cometh. For witlessness,

Fig. 6.—A male mandrake from a Xth century manuscript from Dioscorides in the Pierpoint Morgan Collection.

that is for devil sickness or demoniacal possession, take from the body of this same wort mandrake, by weight of three pennies, administer to drink in warm water, as he may find most convenient ; soon he will be healed. If any see some heavy mischief in his home, let him take this wort mandragoras into the middle of the house, as much of it as he then may have by him, he compelleth all evils out of the house."

The *Grete Herball*, which was the first illustrated British herbal, was published in 1526 with subsequent editions in 1529, 1539 and 1561. It was a translation from the French *le Grant Herbier*, which first appeared at Besançon in 1486 as *Arbolayre*—this in its turn was a translation from a Latin manuscript called *Circa instans*, which is attributed to Platearius.

Under the heading mandragora appears the following :

" Mandrake is colde and drye. There be two maners, the male and the female and the female hath fharpe leves. Some fay that it is better for medycyne than the male, but we ufe of bothe. Some fay that the male hath fygure or fhape of a man, and the female of a woman, but

that is fals. For nature never gave forme or fhape of makynde to an herbe. But it is of troughe that fome hath fhaped fuche fygures by craft as we have fomtyme herde fay of laboures in the feldes. The rynde of ye rote of mandrake is pryncypally good for ufe in medycyne. The fruyte next. And thyrdly ye leves. The rynde of the rote of mandragora may be kept two yeres in vertue and fo lōge it may be ufed in medycyns. It hath myght to hele, to ftaunche and fomewhat to mortyfye and to caufe flepe.

"To caufe one to flepe in a fever ague contyct the rynde of mandrake with womans mylke and whyte of an egge and lay it to the forehead and temples.

Fig. 7.—A dog attached to a mandrake and a little girl stopping up her ears. From a North Italian manuscript *circa* 1450.

"For the payne of the heed caufed of heet. Stampe the leves and lay them on the temples and anoynte the heed with oyle that is made in this maner. Brufe the apples of this herbe mandragora and lay it a grete whyle in oyle, and than feythe it a lytell and whan it is ftreyned it is called oyle of mandrake. It is mervaylous good to caufe flepe and helpeth agaynft payne of the heed yf it be caufed of heate anoynted therwith about the temples and foreheed."

Willam Bullein in his "Bulwarke of Defence againft all Sickneffe, Soareneffe and Woundes that doe dayly, affaulte mankinde" sets out his 'Booke of Simples' in the form of a dialogue between Marcellus who asks the questions and Hilarius who gives the answers. Speaking of mandrake Hilarius says:

"Many fuperfticious and foolifhe thynges have bin devifed of thys herbe: a very invencion of Wytches and Hypocrites, through the

fuggeftion and motion of the devill, to delude the weake hart of mankynde wythall. For they doe affyrme, that this herbe cometh of the feede of fome convicted dead men: and alfo, without the death of fome lyving thinge, it cannot be drawen out of the earth to mans ufe. Therefore, they did tye fome Dogge, or other lyving beast unto the roote thereof wyth a corde, and digged the earth in compaffe rounde about, and in the meane tyme ftopped their own eares, for feare of the terreble fhriek, and cry of thys mandrack. In whych cry, it doth not only dye itfelfe, but the feare thereof kylleth the Dogge or Beaft, whych pulled it out of the earth. And this hearbe is called alfo *Anthropomorphos* becaufe it beareth the Image of a man, and that is

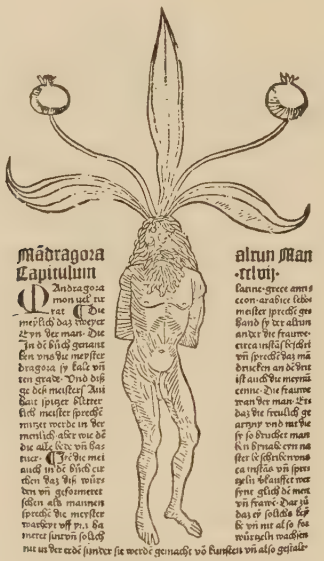

Fig. 8.—A mandrake from the First Edition of the "Gart der Gesundheit," Mainz, 1485.

falfe. For no herbe hath the fhape of a man or woman, no truely, it is not naturall of his owne growing, but by the crafty invention of fome falfe men, it is done by arte. As many rootes may be made in the formes of men, foules and beaftes and fecretly covered in the earth: which when they are found by the crafty hyder thereof, the beholders be dryven into no fmall admiration and wounder, fupposing there by that fome ftraunge fearefull thing, fhall quickly followe the fame. The difcription of this Mandracke as I have fayd was nothing, but the impofterous fubtilty of wicked people. Perhaps of Fryers or fuperfticious monkes, whych have wrytten thereof at length. . . . But there is an herbe called Mandracke, whofe leaves be large and long, lyke unto large Lettice: whofe apples be in the forme of Cheries, very colde . . . This herb hath a long large roote, with two Legges in forme, one wrapped about the other: and fine rootes like hayre, growing upon it. But no armes, feete, fingers, handes, head, nor ftalkes, but ye

leaves creepe out of the ground: of whych herbe be two kindes, male and female, the male greater than the female. This herbe is cold in the thirde degree and hath vertue to caufe deepe fleepe: the ftrength is in the Apple, and in the rynde of the roote . . . The juyce of thys herbe preffed forth and kept in a clofe earthen veffell, according to arte, bringeth fleepe and cafteth men into a trans on a deepe terrible dreame, untill he be cut of the ftone. This herbe fodden in Wyne unto the thirde parte doth purge black choller as well as *Elleborus niger* will do . . . if the roote be cut in fundry places, there wyll come forth a worthy juyce to anoynt the forehead, to bring fleepe. . . . Two halfpeny waight of the pouder of the rynde thereof, may

FIG. 9.—A mandrake from the First Edition of Le Grant Herbier called "Abrolayre," Besançon, 1486.

be drunke in fweete water for the Kynges evil or lacke of fleepe. The juyce thereof with oyle and hony, healeth woūdes: and thus I end of Mandrack, whych in old tyme, it was called *Circaeum* of Wytches, whych had vertue (fayd they) or craft to tranfforme, both man, beaft and herbe out of kynde. Among all other, they wrought wonders by this herbe, to provoke, bewitch or caft men into mad blynd fantafies, or frēfes, called Love, whych rather may be termed, noyfome beaftly luft, and when it is wrought by herbes, foolifhneffe."

In his 'Booke of Compoundes,' there is another dialogue between Sickness and Health in which he gives the following prescription.

"If you wyll caufe one to fleepe, then doe thus as foloweth:— Take ʒii of Henbane, ʒi of the rootes of Mandragora, vi of Popie, of Lettyce, Orpin, Houfleke, ana ʒii, the water Lilie one handfull, when they are beaten, let them be put in two pound of water of popie with

℥i of the feede of Darnell for the fpace of two dayes and let them bee ftilled, and this is perfect."

Jerome of Brunswick in "The Vertuose Boke of Diftyllacion" 1527, says:

"The beft parte and feafon of his dyftyllacyon is the herbe and the rotes ftamped and diftylled in the ende of the may. The forehede, and the temples enoynted with the water of mandrake or dronken a lytyll of the fame cawfeth a body well to fleepe. The hede, the forehede and the temples enoynted with the fame water in the mornynge and at nyght the tyme of two or three dayes is good agaynst the payne in the hede comynge of hete. Water of mandrake flaketh all hete whan clowtes

Fig. 10.—A dog with its tail tied to the mandrake, from the Polish Herbal of Syrennius, Cracow, 1613.

be wet therin and layd upon the body two or thre dayes at eche tyme wet agayn two or thre tymes in a daye. A two or thre dowble clowtes wet in the fame water and wronge oute agayne a lytell and layd upon a paynefull place, it flaketh therwith bycaufe it is ftupefactyfe, that is it taketh away the felynge of the membres and therfore out of his one and proper nature and condycyon it flaketh all wofull paynes."

William Turner who was some time Dean of Wells published a herbal in 1551 and in it he says:

"There are two kindes of Mandrag, the black which is the female, which is called the letticer, with leffe leves and narrower than lettice

whiche have a ftrong favor, and are fpred upon ye grounde. And this kinde bereth apples lyke unto forapples, pale in coloure and well fmellyng, wherein is conteyned fede, lyke unto the kirnelles of peres. It hath rootes of a good bignes II or III, one foldyng itfelf within an other. They are black without and whyte within and they are covered with a thick barke. And thys kynde hath no ftalke. The other kynde is the white mandrag and it is called ye male. The leves of this are byg, white, brode and fmouth as the bete lefe is. The apples of thys are twyfe as byg as the apples of the other be, with a color turnyng toward faffron. They fmell plefantly joyned with a certayn grevoufnes. This kinde of mandrage I have oft tymes fene in England and it is ye

Fig. 11.—Mandrake from Colombini's Herbal, Padua, 1621.

herbe that we call comenly Mandrag. The rootes which are conterfited and made like litle puppettes and mammettes, which come to be fold in England in boxes with heir and fuch forme as a man hath are nothyng elles but folifhe feined trifles and not naturall. For they are fo trymmed of crafty theves to mocke the poore people withall and to rob them both of theyr wit and theyr money. I have in my tyme at diverfe tymes taken up the rootes of Mandrag out of the grounde, but I never faw any fuch thyng upon or in them as are in and upon the pedlers rootes that are comenly to be folde in boxes. "The Mandrag is named in Latin Mandragoras, in Dutch alram. It groweth only in gardines in England and in Germany but it is more comen in England then it is there. But it groweth not under galloffes as a certayn dotying doctor of Colon in hys phyfick lecture dyd tech hys auditores, nether doth it ryfe of the sede of man that falleth from hym that is hanged, nether is it called Mandragoras becaufe it came of mans fede as ye forfayd Doctor dremed.

The juyce of Mandrag dronken in the quantite of a fcruple in honied wyne draweth furth Melancoly and fleme, by vomitynge after the maner of Helleborus, But if a man take to muche of it, it will kill hym. It is good to be menged with the medicines. Men ufe to take the barkes of the frefhe rootes and to ftamp them and to prefke the juyce and to fet it in the fon untill it be growen hard, and then to put it by into erthen veffelles for to be ufed when nede fhall requyre. They use alfo to take of the bark of the roote and to put a threde throw it, and fo to hang it up, and afterwardes to ufe them. There is a juice alfo taken out of the apples, but that is not fo quick in operation as the other juice is. Som take the rootes and fet them in wine untill the thyrde part be fodden away and when the broth is purified kepe it and gyve one cyat or an once and an half of it to them that cannot flepe, and to them that are in great payn and to fuch as muft be burned or cut in fom place that they fhould not fele the burning or cuttyng.

"Wyne may be made of ye roote of Mandrag without any fethyng after thys maner. The poundes of the rootes muft be put into a fmall firkin of fwete wyne, there they muft lye fo long together untill the vertue of the rootes is gone into the wyne. Ye may gyve iii cyates of thys wyne to them that muft be cut, burned or fered. If they drynk thys drynke they fhall fele no payne but they fhal fall into a forgetfull and a flepifhe drowfines. The apples, if a man fmell of them, will make hym flepe and alfo if they be eaten; and so doth the juice that is ftreyned out of them. But they that fmell to muche of the apples become dum. If ye will have the juice ye muft fcotche and pryck the rootes in many places and then fet veffelles under it and fave it. The juice that is preffed out is better then that which droppeth furth after cuttying or fcotchyng. But that commeth not furth in every countre as experiẽce teacheth us. Because thys herbe divers wayes taken is very jepardus for a man and may kill hym if he eat it or drynk it out of meafure and have no remedy for it. I will fhew yow alfo remedy agaynft the poyfon of it. If Mandrag be taken out of meafure, by and by, flepe infueth and a great loufyng of the ftreyngthe with a forgetfulnes. But before that cometh it were wifdome to vomite with mede and afterwarde to take nitre and womwod with fwete wyne or Maluafey, ye muft alfo poure vinegre and rofe oyle upon the patientes heade. It is good tho ftirr the body and to fmell of Agrimoni, peper, muftarde, coftorium and rue brused in vinegre. It is alfo good to fmell of tarr or of the ftynkyng that commeth from a candle that is put out. But if the patient cannot be eafily waked again, it is mete to ufe fuch other comen remedies.

"Avicenna wold that they that are hurt with thys herbe fhould vomit with hony and butter. Whereas Diofcorides wolde that a mans heade fhould have Rofe oile and vinegre poured upon it, when a man hath taken to muche of Mandrag. Matthiolus fayeth that it is againft reafon that it shuld be layd to the heade which is colde whenas the caufe of the difeafes alfo colde."

Turner then gives a discussion between Diofcorides, Matthiolus and Galen and closes the discussion.

> " Now whether that fuch a forgetfull man as thys is ought fo boldely to chek anciant autores or no as he doth at diverfe tymes, let wyfe men and lerned be judges . . . Certayn of the ancientes or old men of Babylon have tolde me that a certayn mayde eat five Mandrag apples and that fhe fell in a fwowne and that fhe becam all rede and that a man commyng by at that tyme poured fnow water fo long upon her heade untill she rofe agayn."

John Gerarde, who is described as Chirurgeon to Her Majesty Queen Elizabeth, published the first edition of his famous (or infamous) herbal in 1597. It was enlarged and reprinted in two editions in 1633 and 1636 by Thomas Johnson, who gives Gerarde away in his introduction "To the Reader," pointing out that Gerarde's original herbal of 1597 was simply a pirated copy of Dr. Priest's translation of the Dutch botanist Dodoens' *Stirpium historiae pemptades sex*, which had been published in 1583. Dr. Priest, however, died before he could publish his translation and Gerarde published it without a word of acknowledgment, passing it off as his own. Gerarde gives the following account of the Mandrake :

> " The male mandrake hath great broad long fmooth leaves of a deepe greene colour, flat fpred upon the ground, among which come up the flowers of a pale whitifh colour, flanding every one upon a fingle fmall and weak foot-ftalk of a whitifh green colour, in their places grow round apples of a yellowifh colour, fmooth, foft and glittering of a ftrong fmel, in which are conteined flat and fmooth feedes in fafhion of a little kidney, like thofe of the Thorne apple. The roote is long, thick, whitifh, divided many times into two or three parts refembling the legs of a man with other parts of his bodie, as it hath beene reported, whereas in truth it is no otherwife then in the rootes of carrots, parfneps and fuch like, forked or divided into two or more parts, which nature taketh no account of. There have been many ridiculous tales brought up of this plant, whether of olde wives or fome runnagate furgeons or phyfickmongers, I know not (a title bad inough for them) but fure fome one or moe that fought to make themfelves famous in skilfull above others were the first brochers of that errour I fpake of. They adde further that it is never or verie feldome to be founde growing naturally but under a gallows, where the matter that hath fallen from the dead bodu hath given it the fhape of a man and the matter of a woman, the fubftance of a female plant, with many other such doltifh dreames. They fable further and affirm that he who woulde take up a plant thereof muft tie a dogge thereunto to pull it up, which will give a great fhrike at the digging up, otherwise if a man fhould do it, he fhould certainly die in fhort fpace after. Befides many fables of loving matters too full of fcurrilitie to fet foorth in print, which I forbeare to fpeake of. All which dreames and old wives tales you fhall from hencefoorth caft out of your bookes and memorie, knowing

> this that they are all and every part of them falfe and most untrue, for I myfelfe and my fervants alfo have digged up, planted and replanted verie many and yet never could either perceive fhape of man or woman. But the idle drones that have little or nothing to do but eate and drinke have beftowed fome of their time in carving the roots of Brionie, forming them to the fhape of men and women, which falfifying practife hath confirmed the errour amongft the fimple and unlearned people, who have taken them upon their report to be the true Mandrakes."

When Gerarde comes to deal with the "vertues" of the mandrake, he says:

> "Dioscorides doth particularly fet downe many faculties heereof, of which notwithftanding there be none proper unto it, faving thofe that depende upon the drowfie and fleeping power thereof, which qualitie confifteth more in the roote than in any other part. The apples are milder, and are reported that they may be eaten being boiled with Pepper and other hot fpices. The juyce of the leaves is very profitablie put into the ointment called *populeon* and all cooling ointments."

Tournefort in his herbal one hundred years later states that mandrake leaves enter as a chief ingredient in the ointment of poplar, but that the herb merchants commonly impose those of *Hyoscyamus luteus* or English tobacco instead and this is not so good. The *unguentum populi* of the Belgian Pharmacopeia contains belladonna, henbane and poplar buds. Gerarde ends his remarks:

> "He that woulde know more heereof, may read that chapter of doctor Turner his booke, concerning this matter, where he hath written largely and learnedly of this fimple."

Old Arab traditions state that the mandrake was used for various complaints that were attributed to demons and the forces of evil. It was said to cure lameness, cramp, epilepsy, insanity and loss of memory, and to afford protection against mishap of all sorts including theft and murder. The Arabs maintained that sometimes the dog survived the occasion and lived to pull up another mandrake. Hannibal, the Carthaginian general, is stated to have captured a large army of Africans by simulating a retreat and leaving behind him on the battlefield a number of jars of wine in which mandrake had been infused. The Africans drank the wine which reduced them to a condition of stupor and so the Carthaginians gained an easy victory. Caesar is also said to have used mandrake for a similar purpose. Joan of Arc is popularly supposed to have possessed a mandrake mannikin which she carried inside her dress hoping by its means to acquire riches. When questioned about it at her trial, she said that she had heard that it caused money to come, but that the voices that spoke to her had never said anything to her on the subject. On sundry occasions in the Middle Ages a woman has been burnt as a witch because she kept a puppet carved out of a root. In many countries roots from various species were carved to the shape of human figures and sold to the innocent and unsuspecting as genuine mandrakes. Apparently there was a great demand for them in England in the time of Henry VIII.

Many of you may have seen that the question was raised in the House of Commons recently of the genuineness of advertisements, and it was then stated by a member as an example that a pixie was advertised to be carried as a charm against evil, which is obviously absurd.

Modern science has shown that when all the folk-lore and witchcraft have been eliminated there still remains a basis for the use of the plant. In the late nineteenth century an alkaloid was isolated, which was given the name of mandragorine, and was later shown to be a mixture of hyoscyamine and hyoscine with a very small quantity of a third alkaloid.

This short account of what might be called a side-line of psychiatry has, I hope, shown you that our forefathers were not so very far wrong in some of their deductions, although the application of these to treatment was probably not altogether in the patients' interests; indeed one wonders just how many people died from the herbal remedy and not from their disease!

SOME FACTORS IN THE AETIOLOGY OF MALADJUSTMENT IN CHILDREN:*

A Comparison of 100 Children "Ascertained" as in Need of Special Educational Treatment and 100 others referred to a Child Guidance Clinic.

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(Based on a thesis for the degree of M.D.Cantab.)

Introduction.

The Education Act of 1944 lays on the Local Education Authorities the duty of providing special educational treatment for certain categories of children distinguished as "handicapped." Included under this heading are maladjusted pupils. These are defined (by regulations) as "pupils who show evidence of emotional instability or psychological disturbance and require special educational treatment to effect their personal, social or educational readjustment." This definition is, in the words of *The Times* (1950), "broadly based," and has indeed been a source of confusion. The first clause asserts a proposition which is very nearly circular, since "emotional instability" and "psychological disturbance" stand as much in need of definition as maladjustment. The second clause makes for even greater uncertainty. Is it intended to indicate that only *some* children showing evidence of psychological disturbance or emotional instability need "personal, social or educational readjustment"? The suggestion that this can be effected by special *educational* treatment has led to much bewilderment. Presumably what is intended is that these children have, in common with other handicapped children, a need for special educational treatment, and also a need for personal, social and educational readjustment. For no other class of handicapped pupils is it suggested that the handicap can be treated by *education*, however widely this term is conceived or however specialized to the particular needs of the handicapped child.

This definition given by the Ministry of Education has had the further unfortunate consequence of leading administrators to think that maladjustment has a precise significance, and that all maladjusted children can be treated in the same way.

A clearer concept would seem to be to designate as maladjusted all those children of the sort who would be judged by a psychiatrist (or the "team" of a child guidance clinic) to need treatment. (Maladjustment is a term whose connotation is of the same order as that of the term "sick," and, just as not all those who consult a doctor would be judged by him to be sick, and just as he

* The Burlingame Prize Essay for 1953.

would point to a number of sick people who fail to ask for medical aid, so can the psychiatrist say that under the heading "maladjusted" ought to be included some but not all of those referred to him and also some who fail to reach his notice.)

Of this large group, a further classification is permitted between those who are and those who are not "ascertained." Those who are ascertained are of a variety of types. The Ministry of Education does not attempt to define or describe any of these. Their only definite stipulation is that the recommendation for a child to be "ascertained" as maladjusted should be made by a psychiatrist approved by the Ministry for the purpose.

Once the child has been ascertained, the possibilities available for complying with the Act are :

1. Special boarding schools for maladjusted pupils.
2. Ordinary boarding schools (provided they are approved for the purpose by the Ministry of Education).
3. "Boarding homes" with attendance at ordinary county schools.
4. Foster homes with attendance at ordinary county schools.

It is clear that the essence of the "special educational treatment" is removal from home.

As the child may remain away from home, with or without holidays at home, for any period up to the remainder of his school life, the decision to send him away is an extremely serious one.

In practice, this decision is usually made in a child guidance clinic where the approved psychiatrist is assisted by a child guidance team and, frequently, by other social workers who have had occasion to concern themselves with the child's welfare. Children attending a child guidance clinic fall into two main groups :

1. A group suffering from some psychiatric disability of congenital or constitutional* type.
2. A group exhibiting the type of symptoms or signs which are held to be indicative of strain in meeting the demands of the environment.

While only a few can be said with certainty to be of the first type, the dividing line between the two groups is not clear cut. Both groups (in common with all children) are having difficulties of adaptation to their environment. The first group may be considered abnormal or potentially abnormal, the second group potentially normal or normal. Clearly there are many borderline cases, and some children who might properly be said to belong to both groups.

Although, in general, it is probably more difficult to cater for the first group in their own homes, the decision to send children away does not depend solely on the nature of their disability. What has to be considered in every case is the relationship between the child and his environment. Some homes may provide the shelter needed by seriously disabled children better than any

* The word "constitutional" has tended to become, in medical language, synonymous with "hereditary." The N.E.D. gives the definition "pertaining to man's physical nature as regards healthiness, etc." It should, therefore, include acquired conditions which permanently affect his physical nature, and is here used in this wide sense.

specialized institutions. At the other extreme, a particularly robust child may stand up to an environment which would, by all ordinary standards, be condemned. In the first case the fact that the child was abnormal would not necessitate his removal from home, nor would the badness of the home in the second.

For practical purposes the definition of maladjustment must take both symptoms and aetiological factors into account. A child cannot be considered in isolation from his home, and so while, for scientific purposes, the condition of the home may be found to be a cause of the maladjustment, for practical, therapeutic purposes it is part of the maladjustment. For this reason the group is not homogeneous. One of the purposes of this paper is to try to make a separation between these two closely interconnected elements of the problem.

Mental health workers—cf. Bowlby (1951)—are aware that material conditions are not an adequate index of the suitability of an environment for a child, and believe that, even for a child of school age, separation from his home can have adverse effects on his mental health, and is not, therefore to be advocated unless it is fairly certain that the advantages will outweigh the disadvantages. Good material conditions in his home may compensate (though not in any exact quantitative way) for bad parental attitudes; other things being equal, the worse the child's disability, the better the environment needs to be.

Criticism of Previous Work.

Surprisingly little attention seems to have been given either to the general problem of the aetiology of maladjusted behaviour in children or to comprehensive studies of the various aetiological factors operating in any given type of disorder. Recently a large number of authors in America and elsewhere have written on the origins of psychopathic behaviour disorders in children, e.g., Bender (1947), Goldfarb (1945, 1947, 1949), Menat (1943) and Spitz (1945, 1946 and 1952) have discussed the relationship between the type of behaviour manifested by the child and the (emotional) adequacy of the home background. These, and a large group of authors, have tried to give the criteria of an adequate background for normal mental development. All the literature between 1940–51 has been summarized by Bowlby (1951), who has specially stressed the importance of good parental attitudes to the child in his early years, and has sought to demonstrate the adverse effects of early separation of the child from its mother. Two recent writers on delinquency, Stott (1950) and Epps (1951), have made a detailed analysis of the home backgrounds of delinquents, and displayed the close connection between unsatisfactory homes and antisocial behaviour. Carey-Trefzer (1949) demonstrated the damage done to evacuated children by separation from their parents.

Material of the Present Survey.

At the present stage of psychiatric work a study of aetiological factors must necessarily remain incomplete. The data to be presented here are those that are available to workers in a child guidance clinic. This study is essentially "Clinical Research"—i.e., the information has been collected in the course

of work directed primarily to therapy While history-taking has been more protracted and more exhaustive than in a general medical clinic, it had not been planned with research in view and the data were not always recorded as fully as could be wished. The data come mainly from the observation of psychiatrist, psychologist and psychiatric social worker, and from the information volunteered by the child and his parent (or substitute)—usually the mother.*

The group studied consists of the first 100 children "ascertained" in 1949 and 1950 as in need of special educational treatment as maladjusted pupils. In what follows this will be referred to as the *ascertained* group.

It is thought that the significant features of the ascertained group can only be brought out by contrast with a control group.

For this purpose a group has been taken which is not a completely random selection, as it was decided that the age range should be that of the ascertained group, and therefore pre-school children (who are numerous in both clinics) were excluded and also children over 15. Other cases had to be excluded because of incompleteness of data ; it seemed justifiable, therefore, to confine the control group to 100 cases which were selected three or four per month over a 15-month period and, subject to the limitations just described, constituted a random sample from the restricted group.

The comparisons that have been made have been subjected to simple statistical tests of significances, but space does not permit of giving the results in every case. Elaborate statistical procedures have been avoided, as it is not considered that the order of accuracy of the basic data is such as to justify complicated mathematical manipulation. In psychiatry, as in the social sciences in general, many assessments must be subjective, many desired facts are unobtainable and many significant phenomena are not susceptible of precise quantitative measurement.

One of the major difficulties for the social sciences has been encountered in the course of this investigation, viz., it is never possible to say that two classes of human beings which are regarded as similar contain individuals who are in fact similar, even in one relevant respect. For example, step-parents will be shown to have provoked an exceptional amount of aggression in the children studied. Yet in the large population that has no need for the services of a child guidance clinic, there are many step-parents who have the happiest relationships with their step-children. Hence the high degree of aggression displayed by the children in the care of substitute parents in the two groups under consideration is not sufficient to establish that substitute parents are themselves bad. Having a substitute parent is one, and one only, of a collection of experiences that the child has had. It is singled out because it is an indisputable and objective fact, but it is certainly not the only important fact in the child's life, and may not be the most important. Moreover, what is important for one individual member of a class may not be important for another. Any attempt to classify human beings must introduce these distortions and

* The word " parent " will be used to include persons exercising guardianship over the child, unless the context calls for an exact statement of the relationship, and " mother " is to be taken, similarly, to stand for female guardian.

sources of error. "There must be two ways of viewing the data: in classes, and as individual living biographies to be understood rather than schematized." Persons engaged in the practice of psychiatry in child guidance clinics are not likely to overlook the "individual living biographies." They are all too conscious of the imperfections of their classifications.

Another difficulty in psychiatric and sociological classification is that the attributes of the individuals classified are not independent of one another. Experiences such as acquiring a step-parent or losing a natural parent are connected with other experiences such as being neglected, being moved from home to home; these in turn with greater proneness to illness, a likelihood of poor attainment at school, a tendency to seek compensations that may militate against the development of character in socially acceptable ways. In social life one misfortune tends to predispose the victim to others.

Even the hostile, rejecting or cruel attitudes of adults to a child are not entirely independent of the child's previous experiences. If, for example, a child were not actuated by the need to "try out" his substitute parents, many of their unfavourable responses would never be elicited. It is not necessary to attribute absolute badness either to them or to the child. Situations arise in which each brings out the worst in the other. When social relations have become pathological, just as in organic disease, vicious circles can be set up and disaster can beget disaster. The "individual living biographies" of 200 cases cannot be given in full, but all contain intricate chains of circumstances from which a limited number of facts, artificially isolated, have been selected for study.

In addition "school failure" was mentioned in 20 cases and was the main complaint in 9, but it is difficult to know whether this frequency is reliable, as attainment tests were not performed as a routine.

Lying has also been excluded from the list, as when it is complained of it is often merely to give emphasis to the main complaint; at other times it may reduplicate a complaint already made. It is less reliably recorded than other symptoms

(1) because it can only refer to the lies that are exposed;
(2) the emphasis placed on it varies with the moral status of the informant.

The only other symptoms noted on referral were:

Stammering	1 case
Asthma	1 ,,
Thumbsucking	2 cases
Fears, anxiety or depression	4 ,,

CHAPTER I.

Symptomatology.

Table I is the standard table of symptoms in use in child guidance clinics, and covers all the conditions for which children were referred to the two clinics in the period under review.

TABLE I.

1. *Nervous Disorders.*

Fears and anxiety.
Depression and lethargy.
Solitariness and unsociability.

2. *Habit Disorders.*

Enuresis.
Sleep disorders.
Habit spasms.
Feeding difficulties.
Hysterical symptoms—Aches and pains.
Vomiting.
Blindness.
Aphonia, etc.

3. *Behaviour Disorders.*

Delinquency (including stealing and lying).
Difficult to manage at home.
Difficult to manage at school.
Aggression.
Truancy and absconding.
Abnormal sexual behaviour.
Temper tantrums.

4. *Constitutional Disorders.*

Bizarre symptoms ? pre-psychotic.
Epilepsy.
Physical defects or disabilities.

The main symptoms of the ascertained group were as follows:

Aggressive behaviour	67
Stealing	28
Enuresis	22
Truanting	19
Encopresis	10
Destructiveness	9
Abnormal sex behaviour	7
Physical disabilities	5
Bizarre behaviour	3
Total	170

The main symptoms given above were found among the control group as follows :

Aggressive behaviour	25
Stealing	16
Enuresis	28
Truanting	5
Encopresis	5
Destructiveness	4
Abnormal sex behaviour	2
Physical disabilities	3
Bizarre behaviour	1
Total	89

but at least 25 different symptoms have been listed (those of Table I).

The Significance of Symptoms.

Table I is the classification in use in child guidance clinics. It is a somewhat haphazard compilation, and is not satisfactory either from the logical or the nosological point of view. In the first place it seems important to make a sharp distinction between the symptoms of Group 4, which are symptoms of organic diseases, and those of the other groups which are symptoms of psychogenic disturbances.

The symptoms in the first three groups are of two sorts :

(1) those which *directly* express a disturbed state of mind, e.g., *aggression, temper tantrums*, etc., and

(2) those which are accepted as the *indirect* expression of a disturbed state of mind. It is now generally accepted that disturbed states of mind can be indicated by manifestations very similar to those which indicate disturbed states of body. It is, nevertheless, a little puzzling that mental disturbances are in some cases directly expressed, whereas in others the manifestations are so remote from the prime cause as to create a difficult problem of differential diagnosis.

A brief account must, therefore, be attempted of current views on this subject. What follows is very largely derived from Slavson, but his terminology, since it seems unnecessarily elaborate, has not been employed.

The states of mind which young children have to express in symptoms are few. The emotions of infancy are love, hate and fear.

These emotions are in one sense " primary," but they appear as a reaction to the emotions and attitudes of the parents. Even in the happiest home all three emotions will be brought into play, for no child can be brought up without sometimes being frightened, sometimes being made angry and resentful ; but in the good home fear and hate do not occasion more than transient disturbances in the smooth passage from infancy to maturity.

If, however, the relationship between child and parent is disturbed, then

emotional disturbance in the child will follow and show itself in disturbed behaviour.

Bad parent-child relationships can be of any magnitude and can be temporary or permanent. The causes are many and complicated : some will be discussed in Chapter II, and the relationship of these causes to the symptoms shown by the Ascertained Group will be discussed in Chapter III, but it will only be possible in this paper to give a full account of the grosser examples.

One of the problems of relating symptoms to mental disturbances is the fact that there is not a simple one-to-one correspondance between *one* symptom and one state of mind. The symptom may express one primary emotion or more than one in combination. The emotion may be quite plainly expressed, or it may be disguised by the form taken by the symptom. The term " direct " will be used of those symptoms which are the normal bodily accompaniments of a strong emotion, the term " indirect " when the emotion is expressed in a more sophisticated way, and the term " compound " when two or more emotions are expressed simultaneously.

Direct Symptoms.

Of the primary emotions, fear might be regarded as the most primitive. Unmodified and uncomplicated manifestations of it are, however, rarely seen in psychiatric practice among children. The reason for this may be (1) that in a civilized community, when a child is giving unmistakable evidence of fear, other agencies intervene : (2) that children rarely get to a child guidance clinic in the acute stages and " in time we hate that which we often fear." Fear can be recognized as a component in some of the indirect and compound symptoms. It may be that when apparently hate is being directly expressed, fear is also being expressed. (Or, alternatively that fear has given way to hate.)

Just as physical health can be harmed by undernutrition as well as by a noxious diet, so can the child's mental health be affected by neglect and lack of affection as well as by ill-treatment (Spitz, 1952). And just as the reaction to undernutrition can be voracity, perversion of appetite or anorexia, so can the reaction to lack of affection be a craving for excessive stimulation, sexual perversion or apathy. The number of cases described as exhibiting " abnormal sexual behaviour " is small. When due allowance is made for the tendency to regard as abnormal *any* manifestation of sexual behaviour in a young child, the number becomes negligibly small. Some components of the compound symptoms can be seen to have sexual significance.

Consequently almost all the direct manifestations of primary emotion which bring a child to the psychiatrist are aggressive.

The function of psychogenic symptoms, whether direct, indirect or compound, is (1) to serve as evidence of the disturbed state of mind, (2) to gain some advantage, and (3) to have an effect on the feelings of others. It is obvious that aggressive symptoms fulfil the first and third functions. The effect that they wish to have on the parents may be regarded as " punishment " (i.e., to retaliate and, in an unformulated and rudimentary way, also to deter and reform.)

Indirect Symptoms.

Direct symptoms incur disapprobation. Their persistence in spite of measures taken against them is an indication of the strength of the underlying feelings. Painful consequences are, within wide limits, deterrent, and it is to be presumed that they will always have some effect It may not, however, be the desired effect. When the strength of the primitive impulse is very great, retributive action may only intensify it. If the impulse is slightly weaker, the effect may be to modify the symptom. A group of symptoms can be distinguished which would seem to common sense to be expressing a strong and aggresive feeling, but not with the same complete lack of organization as primitive aggression. These are to be described as "indirect." Direct and indirect symptoms between them make up Slavson's group of "primary behaviour disorders."

Compound Symptoms.

With increasing maturity the child develops a "conscience," i.e., a sense of guilt : When this has happened* the child will blame himself as well as others for his misfortunes and the symptoms will have the further function of *self-punishment.*

It is because of the number of ends being served simultaneously by compound symptoms and because the relation between the components is not necessarily one of simple summation that the symptom produced may seem at first sight so remote from the major mental disturbance.

This can be particularly well seen in adult neurotics : Freud, for instance (1917), takes the view that "melancholia" is the symptom produced when the patient combines grief for the loss of a loved object with the belief that he was responsible for the loss. He may punish himself to the point of self-destruction.

Even in this extremity he punishes others : the neurotic's "They'll be sorry when I'm dead" is all too true. None of us is quite free from self-reproach about our treatment of others and we are, therefore, vulnerable when they die.

As a further example, the hysterical symptom serves many purposes. The patient "gains through illness" ; he finds his way to the centre of attention. At the same time he punishes others by the inconvenience he causes them. Nevertheless, their loss of normal pleasures and satisfactions is small compared with his. Still other purposes can be detected Some feature of his symptomatology will give a clue to the reason why he finds it necessary to go to such lengths to punish himself and others. These two examples have been given to show the complexity of symptom formation. They also demonstrate the presence of a powerful aggressive component even in behaviour which superficially shows no trace of it.

It seems possible, then, to arrange symptoms in an order of increasing complexity from aggression undisguised and unalloyed to manifestations in which aggression is one of many components and is nearly, if not completely, hidden

* It is not, of course, to be supposed that "conscience-formation" is a simple or instantaneous process. At any given time it may be imperfect in degree or extended only to certain of the person's activities.

from view, partly because it is overlaid by others, partly because it appears in such an unrecognizable form.

Symptom-Formation in Childhood.

The psychogenic symptoms of children represent all degrees of complexity between the extremes.

Certain symptoms other than primitive and unmodified aggressive behaviour ("primary aggression") seem to be almost purely aggressive: *destructiveness* and *stealing*, for example, seem to be very near to pure primitive aggression but can be seen to be, to some small extent, more "organized."

Truanting is held to have a large aggressive component—it is, in effect, an attack on authority—but often contains a component of fear, as well as of hostility.

In *encopresis* we come to a symptom where the offensive weapon is turned not only against others but to some extent against the patient himself. Even is (as commonly appears to be the case) he is not directly offended by it, he is indirectly injured by the social ostracism to which it leads.

These four symptoms can be regarded as indirect. They express, with a little disguise, the state of mind of the patient, and are directed very much more obviously against others than against the self.

A symptom that is difficult to place in the scale is *enuresis*. Physiological in the infant, aggressive in the young child (who gives offence by it but suffers little or no inconvenience himself), it comes to contain a large self-punishing element when, e.g., because of it, a child dare not sleep away from home, or an adult has to avoid a desired career or even renounce the idea of marriage.

The other "habit disorders" of Table I conform very closely to the neurotic symptoms of adults.

A possible regrouping of psychogenic symptoms would then be:

I. *Direct Symptoms.*
  Symptoms of primary emotions:
    (*a*) abnormal sexual behaviour.
    (*b*) "primary aggression."
II. *Indirect Symptoms.*
  "Secondary aggression," viz.:
    (*a*) Destructiveness.
    (*b*) Stealing.
    (*c*) Truanting.
    (*d*) Encopresis.
III. *Compound Symptoms*, viz.:
    (*a*) "Habit disorders."
    (*b*) Hysterical symptoms.
    (*c*) Depressive symptoms.
    (*d*) Anxiety symptoms.

This analyses without remainder the symptoms of the first three groups of Table I except for enuresis. This symptom, for the reasons already given,

cannot be assigned to any one class. Furthermore, it is quite frequently of organic origin, though this is often overlooked when it appears at the same time as symptoms that are psychogenic.

The objects of this long-drawn out-discussion are—

(1) *General*: to give a partial account of the nature of psychogenic symptoms and to display some, at least, of the ends they serve.

(2) *For the purposes of this paper*: to find some unity among diversity to make a basis for.

(*a*) an objective index of the "severity" of the disturbance of the child;

(*b*) a measure for comparing the ascertained and control groups;

(*c*) a criterion by which the significance of aetiological factors can be judged.

It has been pointed out that "belonging to the ascertained group" is not a simple character and, though it is of interest and importance to find that a certain factor appears with more frequency in the background of the ascertained than in that of the control group, it does not enable us to identify the feature of maladjustment with which the factor is associated. If it can be accepted that, in spite of its multiplicity of manifestations, aggression is a unitary character, then the problem becomes more interesting in that we need not confine our study to associating aetiological factors with ascertainment, but can explore the connections between external disturbances and expressions of aggression in the child (see Chapter III).

Difference in Symptoms manifested by Ascertained and Control Groups.

This simplified classification can now be used to bring out certain differences between the ascertained and control groups.

	Ascertained.	Control.
Direct symptoms		
Abnormal sexual behaviour	7	2
Primary aggression	67	25
Indirect aggression		
Secondary aggression	66	30
Compound symptoms	8	60
Enuresis	23	28

This comparison shows the predominance in the ascertained group of (1) direct symptoms and (2) symptoms of aggression.

There is little difference in the incidence of enuresis in the two groups, but there is the difference, not indicated above, that in the control group it was often the only symptom: in the ascertained group, never.

The 100 children of the ascertained group have between them a rather larger number of symptoms than the control group. The difference is not great, but it is at least possible that it should be bigger: The minor symptoms of the ascertained may seem unimportant by comparison with their major problem. On the other hand, there may be a tendency to make up in quantity for the lack

of severity of the symptoms of the control group to justify their claim for attention. Absolute accuracy cannot be attained, but the differences between the two groups are great enough to make quantitative comparisons worth while in spite of some margin of error.

Aggressive Symptoms.

The only source of inaccuracy about aggressive symptoms is the possibility that exasperated informants will exaggerate their severity. In most cases, however, information was available from school and other sources as well as from home and reports were consistent: moreover, confirmation from the subsequent history was available in almost every case.

Aggressive Temperament.

The number of aggressive children cannot be deduced from the number of aggressive symptoms.

There are two ways of arriving at the number of aggressive children: (1) to designate as "aggressive" each child showing one or more aggressive symptoms; (2) to obtain an independent assessment of "temperament" from observers. This assessment was made by the child guidance clinic staff on the basis of their own observations and the information provided by the schools.

Each child was rated as either—

1. Aggressive,
2. Dejected,*
3. Neither,

and the degree of aggression or dejection was also rated as severe, moderate or mild. While this has the usual defects of subjective estimates, it serves to draw attention to a group of children at the extreme end of the aggressive scale who can fairly be designated as violent.

These have been brought to our attention on account of damage to life or property, because schools refuse to keep them or relatives to house them. Children with aggressive temperaments were found in both ascertained and control groups but in very different proportions:

	Estimate of aggressive temperament.							Total.
	+++	++	.+	±	−	−−	−−−	
Ascertained . .	28	32	12	12	8	7	1	100
Control . .	3	14	11	42	17	10	3	100
Total . .	31	46	23	54	25	17	4	200

$x^2 = 22{\cdot}2$. $P > 0{\cdot}01$. (for $n = 4$)

Of the aggressives, those classed as "violent" number 28 in the ascertained group, three in the control group.

* The term "dejected" has been taken as the nearest opposite of aggressive. It is used to cover children described as "depressed," "timid," "withdrawn," etc. It is unfortunate that there is no exact antonym.

In neither ascertained nor control group was there any appreciable difference between boys and girls in the incidence of the aggressive temperament. In both groups there were more boys than girls who were violent (in all 22 boys, 9 girls) but the numbers are too small for this difference to be statistically significant.

Number of Children Manifesting Aggressive Symptoms.

The number of children manifesting aggressive symptoms is smaller than the number of symptoms, since some children manifest more than one aggressive symptom. It is not the same as the number manifesting primary aggressive symptoms, since it will include those who manifest *only* secondary aggressive symptoms.

It cannot be very different from the number judged to have the "aggressive temperament," since all those manifesting primary aggressive symptoms will be judged to have the aggressive temperament. So, however, will *some* of those manifesting secondary aggressive symptoms. A discrepancy arises (1) because not all those manifesting secondary aggressive symptoms will be judged to have an aggressive temperament; in spite of the symptom, some appear to the judges to be "dejected" and some "neither aggressive nor dejected"; and (2) because some are judged to have the aggressive temperament without a specific aggressive symptom being recorded (three in the control group).

	Ascertained.	Control.
Number manifesting primary aggressive symptoms	67	25
Number rated as aggressive	72	28
Number manifesting secondary aggressive symptoms (but not rated as aggressive)	11	16

On the assumption that dejection can be an indirect symptom-complex in which hostility is an important component, any child in this group who also shows other evidence of aggression should be placed in the aggressive group.

On this calculation the number of aggressive children in the ascertained group becomes 83, in the control group 44. The remainder manifested the type of symptoms referred to above as "compound."

In the ascertained group there was in every case some additional factor, such as organic disease or defect or some special circumstances in the home background, which weighed the scales heavily against the likelihood of profiting by treatment as an out-patient.

Severity of Aggression.

The assessment of temperament has already indicated that the aggression of the ascertained group is more severe than that of the control group. This can also be tested by an analysis of the number of children exhibiting one, two, three or four aggressive symptoms respectively (counting a rating of aggression as one symptom).

	Ascertained.		Control.	
Aggressive symptoms.	*Number.*	*Per cent.*	*Number.*	*Per cent,*
One symptom . . .	47	57	33	75
Two symptoms . . .	25	30	9	21
Three symptoms . . .	8	10	1	2
Four symptoms . . .	3	3	1	2
Total	83	100	44	100

The difference between the proportion exhibiting one symptom only and that exhibiting two or more in the two groups is statistically significant.

It may not always be legitimate to suppose that a person who shows several aggressive symptoms is more aggressive than another who shows only one but shows that very strongly. When individual patients are being dealt with, evidence accumulates from a variety of sources to show the "strength" of feeling in each case: but when groups are being dealt with, the additional qualitative information cannot be used. As a rough index it seems reasonable enough to assume that the group which shows the larger number of aggressive symptoms is, in fact, the more aggressive. This seems more than ever justified in view of the consistency of this result with that obtained from the assessment of temperament.

To sum up at this stage: The ascertained group differs from the control group by containing (1) significantly more children manifesting the "aggressive temperament," (2) a significantly greater number of aggressive symptoms, and (3) more aggressive symptoms per aggressive child, i.e., not only are there more aggressives in the ascertained group but on the average they are more severely aggressive than the control group. Although aggressiveness is not the only attribute distinguishing the members of the ascertained from the control group, it is more significant than any other.

Two not immediately self-evident propositions emerge from this discussion of symptoms:

(1) The differences between the ascertained and control groups, though great, are not absolute.

(2) The meaning of "severity" in psychiatric problems is complex; on the one hand the judgment is clinical, on the other social, i.e., when a child is ascertained as maladjusted and removed from his home, he may be ill or he may be a nuisance or both. The fact that a child is a nuisance plays perhaps the biggest part in reaching the decision that he needs "special educational treatment" away from home, but it cannot be the sole deciding factor, since there are a certain number of nuisances in the group not ascertained.

CHAPTER II

Aetiological Factors.

Data Suggesting a Constitutional Factor.

Hereditary Factors.

The data available do not permit of a detailed inquiry into genetic factors. Information about grandparents and collaterals is based on hearsay, and it is

to be expected that the information will be biased by the well known tendency to find positive traits more frequently among the collaterals of patients who themselves exhibit a positive trait.

Moreover, in spite of a high incidence of mental disorder in the parents of the children studied, there are comparatively few cases where the behaviour of the child, however anti-social, could not be regarded as the reaction of a normal child against intolerable circumstances.

There were in all twelve families in which a child exhibited symptoms of a recognized mental disorder.

Of these families with an affected child, five gave a positive family history (one or both parents affected) : both parents were affected in two cases. The incidence is certainly higher than would be expected in a completely chance association. In view of the small size of the group, little more can be said. In view of the fact that the children were all below 15 years of age it is perhaps significant ; i.e., that if gross mental disease is present in a child, it is likely that one or both parents suffer from a mental illness. Because of this limited age-range, no evidence to the contrary can be adduced from the cases where the parent was suffering from a recognized mental illness, but no comparable diagnosis could be made for the child.

TABLE II.

Diagnosis of child.	Number of children.	Diagnosis of—	
		Father.	Mother.
Ascertained :			
Epilepsy	3	0	0
Schizophrenia	2	" Schizoid "	0
Paranoia	1	0 " Psychopath "	" Schizoid " Hysteric
Depression	1	Depressive	" Neurotic "
Mania	1	0	0
Total	8	3	3
Control :			
Epilepsy	2	0	0
Schizophrenia	1	Schizophrenia	0
Depression	1	0	0
Total	4	1	0

Sex and Age.

There were 64 boys and 36 girls in the ascertained group, 58 boys and 42 girls in the control group. The difference in sex composition of the two groups is not significant and no difference has been found to be related to sex. Consequently boys and girls have not been treated as separate groups.

Age.

In the ascertained group there were 58 cases under eleven, 42 over : these numbers are very closely in proportion to the school population (roughly 6/10 under eleven, 4/10 over eleven). The average age for boys was 11·8, for girls 10·0, for boys and girls together 11·1 years.

In spite of the fact that the age range of the control group was chosen to correspond with that of the ascertained group (5—15+), the average age was 9·7 (see Table III).

There is a significant excess of children from the infants' schools in the control group, a significant excess from the secondary schools in the ascertained group. In the ascertained group there are two peaks, one in the ninth year, one in the twelfth. The excess in these two years is significant.

Intelligence.

The children in both groups were given the Terman Revision of the Stanford-Binet Test and the distribution of I.Qs. is shown in Table IV. In the ascertained group the range is from 80–170. The I.Q. range does not go below 80, not because duller children are not maladjusted, but because schools will not accept them. The mean I.Q. of the ascertained group was 104, the median 100 and the mode 92.

There are 47 children with I.Qs. between 80 and 100, 32 between 100 and 119 and 21 have an I.Q. above 120.

In the control group the mean I.Q. is 105·7 with median and mode respectively 105 and 104. The range is from 67 to 150 and the distribution is symmetrical, i.e., the difference between the two groups is in the distribution rather than in the means.

TABLE III.—*Ascertained Group: Relationship between Age and I.Q.*

	I.Q.				Average
Age.	Under 100.	100–119.	120 +.	Total.	I.Q.
Under 11	30	23	5	58	101·3
11	7	5	5	17	100·5
12	6	4	2	12	104·0
13	4	0	4	8	110·0
14	0	0	3	3	135·0
15	0	0	2	2	140·0
Total	47	32	21	100	104·0

TABLE IV.—*Control Group: Relationship between Age and I.Q.*

	I.Q.				Average
Age.	Under 100.	100–119.	120 +.	Total.	I.Q.
Under 11	25	34	9	68	107·0
11	3	3	4	10	112·0
12	2	5	0	7	104·3
13	3	2	0	5	98·0
14	1	1	3	5	108·0
15	2	3	0	5	102·0
Total	36	48	16	100	105·7

36 of the control group had I.Qs. between 80 and 100, 48 between 100 and 120 and 16 above 120.

The high value of the mean in the ascertained group is accounted for by the excess of older children in the ascertained group. Since the school-leaving age is higher for grammer schools than for secondary modern schools, all those

in this group aged 14 and 15 come from grammer schools (which cater for children with I.Qs. above 120). This accounts for the fact that 16 of those over eleven have an I.Q. above 120 as compared with 5 of those under eleven.

A comparison has therefore been made of the distribution of I.Qs. among children of primary school ages (five to eleven) to give a better picture of the difference between the ascertained and control groups. In the ascertained group more than half of these had I.Qs. below 100 ; in the control group approximately one-third. The difference is significant.

It was noted that there was an exceptionally high incidence of ascertained children between the ages of eight and nine. It is of some interest that of the 18 ascertained children of this age no less than 14 were below average in intelligence and none had an I.Q. above 110. This is significantly different from the expected frequency (50 per cent. below 100, approximately 25 per cent. above 110). In the control group there were only 10 children of this age, but 7 had an I.Q. of 100 or more.

It might be inferred that duller children manifest the symptoms which lead to ascertainment at an earlier age than bright ones. It may be that the pressure of school work becomes serious for the first time in the ninth year with a selective effect on the behaviour of duller children.

Environmental Factors.

Social and economic.

The districts from which these samples are drawn are reasonably prosperous suburban and dormitory areas. An assessment of social class by the health visitor notifying births put the majority into the Registrar-General's Social Class III, but with considerably more in Classes I and II than in Classes IV and V. While our data do not permit great exactitude on this subject they suggest that the clinic population does not follow the pattern of the rest of the community from which it was drawn. Financial hardship and poor material circumstances are more frequent than would be expected and affect from one-third to one quarter of our patients. These assessments are subjective and not quantitative, but are reasonably reliable. The ascertained and control groups are not significantly different in these respects, and while economic and social differences may play some part in bringing children to the child guidance clinic, there is no evidence that they effect the likelihood of any particular child's being ascertained as in need of special educational treatment.

Size and position in family.

The calculation of size and position in family is not completely free from difficulties.

First of all, how should a family be classified where one or more sibling has died ? Goodenough and Leahy (1927) adopted the arbitrary rule of excluding from their calculations siblings who had died before their third birthday. This does not seem satisfactory from the psychological point of view : death does not remove the memory of a sibling from a child's mind ; it seems better, therefore, to exclude miscarriages (about which information is, in any case, extremely

inaccurate), but to count all other siblings, including the stillborn. In the present material there were extremely few deaths recorded; no serious error would be introduced whatever system were adopted.

A much greater difficulty is presented by the number of "composite" families arising from such circumstances as illegitimacy, adoption, remarriage and irregular unions.

The principle has been adopted of regarding as a sibling anyone whom the child would consider a sibling, i.e., if a child is adopted and subsequently a natural child is born, the adopted child is counted as the first of two. Similarly, if a widow with two children marries a widower with three and they subsequently have two of the marriage, the eldest is regarded as the eldest of seven. There is thus a slight tendency to weight the figures towards the larger families. The error introduced should affect both ascertained and control groups equally and, in view of the infrequency of large families, the amount of error must be small.

The one striking point brought out by this comparison is that "only" children are very much more frequent in the ascertained group than in the control group. The difference is highly significant. This has been found by others and accepted as evidence that only children are more prone to mental disturbance than members of large families.

The excess of only children in the ascertained group cannot, however, be taken as a sufficient indication that only children are specially prone to psychological disturbance. When family background is discussed, it will be seen that a high proportion of ascertained children come from "broken" homes, in which it might be expected that families would be smaller than in intact homes. A significant difference has been found between the proportion of only children in broken and in intact homes, If, as it is hoped to established later, the condition of the home is a major aetiological factor of maladjustment, then the greater proneness of only children to maladjustment may be no more than a reflection of the fact that a high proportion come from broken homes. In the 43 intact homes in the ascertained group there were 17 (42 per cent.) only children. This proportion is not significantly greater than the 28 per cent. in the control group. Moreover most of these families were "incomplete" families and, therefore, small numbers tend to predominate over large. However a sample of 220 cases taken from a children's hospital in which children were seen up to the age of 13, contained 10 per cent. of only children, 36 per cent. of families of two, 21 per cent. of families of three, 33 per cent. of families of four or more children. The differences between the maladjusted control group and the hospital group are significant as regards only children and as regards families of four and over.

This might be taken as evidence of the increased susceptibility of only children to mental disturbance, but it might equally well be interpreted as evidence of the proneness of members of larger families to organic illness. Whether members of large families are, in fact, less susceptible to mental disturbance is open to doubt. There are many reasons why members of large families are not brought to child guidance clinics. The figures presented here may suggest that their mental stability is greater, but this should not be accepted without further investigation.

Home Background.

Condition of the Family.

Ascertained Group.

1. *Civil status, etc.* (see Tables XI and XII).— Of the ascertained group, 71 were legitmate, 24 illegitimate and 5 doubtful. 43 were living with both parents. 19 were living with one parent only (17 with the mother). 38 had some person other than the natural parent in place of one or both parents; i.e., 43 homes were intact, 57 broken.

Of the broken homes 10 had become so through the death of one parent. The remaining 47 were due to separation or divorce or irregular union.

2. *Intact homes.*—Of those living with both parents, 13 only have a home in which, on the most lenient standards, the parental relationship could be described as satisfactory.

In the other 30 homes it was in the highest degree unsatisfactory.

3. *Broken homes.*—The 57 children in this group had the following backgrounds:

	Children.
One parent only	19
Step parents*	23
Adoptive parents	7
Foster parents*	4
"Homes"	4
	57

* It is impossible to give a precise account of every parental relationship. A household with an adult fulfilling the role of stepmother or stepfather is counted under this heading whether the adults are legally married or not. Aunts, grandparents, etc., who have undertaken the upbringing of their relatives' child are counted as foster parents.

Control Group.

Of 100 children 91 were legitimate, 8 illegitimate and 1 doubtful.

81 were living with both natural parents, and in 62 of these homes the parenral relationship could be regarded as satisfactory.

Twelve parental relationships were unsatisfactory by virtue of marked marital discord, 7 through severe mental illness in one or both parents.

Of the 19 children not living with both parents, 6 were with one parent only, 4 were with one step-parent, 4 were with adoptive parents, 2 in homes.

Table V—.*Condition of Family.*

	Both parents.	One parent only.	Substitute parents.	Home.	Total.
Ascertained	43	19	34	4	100
Control	81	6	11	2	100
Total	124	25	45	6	200

$\chi^2 = 94{\cdot}9$. $P < 0{\cdot}01$. Highly significant.

In six cases the "break" was due to the death of a parent. The differences just discussed between the ascertained and control groups are significant.

TABLE VI.—*Comparison of Parental Relationships in Intact Homes in Ascertained and Control Groups.*

	Intact homes.				
	Satisfactory.		Unsatisfactory.		
	Number.	Per cent.	Number.	Per cent.	Total.
Ascertained	13	30	30	70	43
Control	62	77	19	23	81

TABLE VII.—*Comparison of Attitude to Child in Intact Homes.*

	Intact homes.				
	Satisfactory.		Unsatisfactory.		
	Number.	Per cent.	Number.	Per cent.	Total.
Ascertained	6	14	37	86	43
Control	52	64	29	36	81

TABLE VIII.—*Comparison of Attitude to Child in Broken Homes in Ascertained and Control Groups.*

	Broken homes.				
	Satisfactory.		Unsatisfactory.		
	Number.	Per cent.	Number.	Per cent.	Total.
Ascertained	6	12	47	88	53*
Control	8	47	9	53	17*

* Four children in " homes " in ascertained group and two in control group have been excluded from these totals.

Thus in the ascertained group, there were three times as many illegitimate* children as in the control group and there were only half as many " intact " homes as in the control group.

Other Factors in the Home Background.

So far the condition of the home has been discussed: i.e., whether it is *now* intact or broken. At least three other factors which play a big part in determining whether, from the child's point of view, the home can be regarded as satisfactory, can be singled out for discussion:

(1) the relationship between the parents,
(2) the attitude of one or both parents to the child,
(3) the child's experience of separation from one or both parents.

* It is of some interest to note that the illegitimacy rate per 100 live births in the districts under discussion rose from 4·5 before the war to a maximum of 9·35 in 1945. The number of illegitimate children to be expected in a group born between 1934 and 1944 would not be above 6 per cent. The number in the ascertained group is therefore very highly significant. The number in the control group is nearer to that of the population as a whole, particularly in view of the fact that more of the control group were born in years when the illegitimacy rate was higher. It might also be noted that the illegitimacy rate takes no account of two categories of children who may be much affected by the sexual irregularities of their parents, viz., (1) those legitimized after their birth by the marriage of the parents; (2) those technically legitimate, but not, in fact, the children of their mother's husband. No accurate figures are available of the numbers in these categories.

Relationship between Parents.

In the ascertained group, in only 13 of 43 intact homes were the relationships between the parents considered to be reasonably satisfactory.

> The qualifications "good" and "bad" are used of the parental relationships (and in the next section of attitudes to the child). These words are used, not in any absolute sense, but as convenient abbreviations. "Good" characterizes any home above a certain arbitrary and subjective level of tolerableness, "bad" anything below that level. In almost every case characterized as "bad" there is fairly strong evidence of the presence of what "any reasonable man" would regard as badness. When the epithet "good" is applied, it may mean no more than that nothing is known to the contrary.

In the remaining 30 the parents quarrelled violently with one another, were threatening to separate, or had in fact separated one or more times. Mental illness of one or both parents accounted for the bad relationship in 10 cases, the difficulties of the parents were aggravated by the antagonistic attitude of relatives in 4 cases. In the control group, the parents in 62 of the intact homes were judged to have a good or reasonably good relationship. The assessment is subjective and, to an exceptional extent, dependent on the truthfulness of information given by parents in interviews. The tendency of the informants is to conceal the worst of their difficulties until they have got to know and trust the workers interviewing them. Since, when the judgments were made, different parents were known for different periods of time, the assessments cannot all be of the same order of reliability They are, however, made by highly experienced workers; and often enough the parent's stories are amplified by those of the child. Such error as there is would be in the direction of over-estimating the number of "satisfactory" relationships, and this bias would be, if anything, greater in assessing the ascertained group than the control group since, on the whole, when the assessments were made the parents of the ascertained group were not quite so well known to the clinic workers as those of the control group.

For practical purposes there is only one case about which doubt is felt, but this may be due to too great self-confidence on the part of the interviewers!

There seems, however, every reason to accept the conclusion that relationships between the parents were very much more often unsatisfactory in the ascertained group than in the control group.

Attitude to Child.

Ascertained Group.

Only 12 of the families in the ascertained group were judged to have a good attitude to the child; in 32 homes the child experienced cruelty and in 55 others some other unsatisfactory attitude.

Unsatisfactory Attitudes.

Cruelty.

Corporal punishment is employed as a disciplinary measure in almost every familiy attending these child guidance clinics and few parents hesitate to hit

very hard on occasions. Something very much more than this is meant when the word cruelty is used : e.g., one father (a physical and psychiatric casualty from the war) actually said in the clinic,'' Sometimes I can't get at her with my hands, then I just kick her with my boots.'' The discriminations that step-parents can make between there own and their step-children might tax the credulity of those without first-hand experience. Only three children in the control group experienced cruelty and in all three cases there was some mitigating factor (see below).

Hostility, Rejection, Inconsistency, Neglect, etc.

A surprising number of parents and substitute parents openly expressed hostility towards their children. The neglectful or inconsistent behaviour of other parents is the subject of complaint by teachers and welfare workers and, often enough, corroborated by the stories told by the parents themselves.

By '' rejection '' is meant a basically hostile attitude overlaid by one which is superficially kind or affectionate. The detection of such an attitude is a matter of inference rather than of direct observation. Being a judgment, the assessment of parental attitudes may be wrong, and different observers might make different judgments. This applies with particular force to the judgment of '' rejection.'' The sort of evidence on which it is based is (1) excessive protestations of devotion ; (2) undue protectiveness or anxiety for the child's health and safety ; (3) behaviour towards the child which seems distinctly less intelligent than that of the parent in other directions.

It will be observed that the '' attitudes '' of the control group have been put into four classes as against three in the ascertained group. The attitudes of the parents of the ascertained group can be simply classified as either '' good '' or '' bad.'' In the control group there were 28 cases in which the parental attitude could not unreservedly be called good—it was characterized by anxiety, indecision, over-protectiveness, hypochondria, etc., yet seemed better and more likely to change than attitudes characterized as hostile, rejecting, inconsistent, etc. (It is just this group of parents with whom child guidance clinics have their greatest success ; experience shows that these midly neurotic attitudes can be modified with the help of a skilled psychiatric social worker. While not good, they may be regarded as potentially good.)

Control Group.

Cruelty.

It may be asked why not send away the children in this group who were victims of a bad parental attitude—or at least those subjected to cruelty?

Two children were old enough to withstand ill treatment and had a number of mitigating circumstances in their environment, one was five and may be sent away eventually. [N.B.—She was in 1952.]

Hostility, etc.

As to this group of cases, most homes were more tolerable than those of the ascertained group. A certain number of children are undoubtedly border-

line cases who, if young enough, may eventually be sent away. The fact, already referred to, that the school-leaving age is 15 for the majority of children is a reason for not interfering with some of the older children.

Separation of Child from Parents.

Bowlby (1951) and the authors he refers to have laid stress on separation of the child from his natural parents, particularly from the mother, as a major factor contributing to disturbance in the formation of character, and leading to anti-social and delinquent tendencies and, in particular to what is called the "affectionless character." Separations, whether permanent or temporary, are held by these authors to produce these adverse results and, in their opinion, the younger the child at the time of separation the more damaging the effects.

Separation for a shorter or longer period has been a frequent experience in the groups under discussion in this paper : 110 of the 200 children considered here had experienced some period of separation (longer than six months) from mother, father or both parents.

It is suggested that while all separation has bad consequences, the effects differ with differences in the type and length of separation.

Duration of Separation.

It seems necessary, therefore, to distinguish between separation which is permanent and that which is temporary (i.e., followed by reunion with the parent or parents). An occasional brief period of separation such as almost every child experiences cannot be taken into account, if only for the reason that it is not likely to have been accurately recorded. The sort of period that Bowlby has in mind is six months or longer. Those cases have therefore been recorded where either there was a continuous period of separation of six months or longer or there was a series of briefer separations amounting together to at least six months.

Parent from whom Child Separated.

It is also necessary to distinguish between separation from (1) the mother, (2) the father, (3) both parents.

Date of Separation.

It is also important to record whether the separation took place early in the child's life or later. Bowlby takes the age of four as the dividing line. Hence separation from parent or parents, if it has occurred before the fourth birthday, will be referred to as "early," if on or after the fourth birthday, as "late."

Those groups already distinguished under the heading "homes," "adoptive parents" and "foster parents" contain, by definition, children who have been permanently separated from both parents, but a further analysis can be made to show whether the separation was early or late. In the groups "one parent only" and "step-parents" it remains to be shown whether the permanent

separation was early or late and from which parent. In the "intact" group, periods of temporary separation can be classed as early or late. Of the 110 children who had experienced any period (longer than six months) of separation from one or both parents, 72 were in the ascertained group, 38 were in the control group. Taking period of separation, time of separation and parent or parents from whom separated into account would necessitate placing "separated children" in twelve classes. Each would then contain on the average nine or ten members—a number too small for useful statistical comparisons.

One amalgamation of classes that seems justifiable is of those who have been separated from the mother and those who had been separated from both parents. The amalgamation of these two classes is not entirely satisfactory, for it cannot be supposed that their experiences are exactly similar. Their members have, however, one significant experience in common, namely, that they have passed into the care of some woman other than their mother. (A substitute mother is almost invariably supplied for a motherless child, but not necessarily a substitute father for one who is fatherless.)

This still leaves two main classes each with four sub-groups, viz.:

1. *Separation from Mother or Both Parents.*

(1) Permanent.	(2) Temporary.
a. Early.	*a.* Early.
b. Late.	*b.* Late.

2. *Separation from Father.*

(1) Permanent.	(2) Temporary.
a. Early.	*a.* Early.
b. Late.	*b.* Late.

As the "separated children" in both ascertained and control groups can be divided into these eight classes, the number of comparisons that can be made is large. The data have been collected and shown in Tables IX and X.

TABLE X.—*Permanent Separation.*

	From mother or both.			From father.			Total permanent separation.
	Early.	Late.	Total.	Early.	Late.	Total.	
Ascertained	17	11	28	21	8	29	57
Control	8	2	10	3	6	9	19
Total	25	13	38	24	14	38	76

Temporary Separation.

As regards temporary separation there is no appreciable difference between the experience of the control and of the ascertained group, i.e., there is no evidence that the temporary separation either from father or from mother is associated with being "ascertained" (the numbers are small and the absence of a statistically significant association does not, of course, prove that there is none—it simply fails to provide evidence that there is).

TABLE IX.—*Separation from Parents.*

	From mother or both.							From father.							Total separation of any kind of more than six months.
	Permanent.			Temporary.			Total.	Permanent.			Temporary.			Total.	
	Early.	Late.	Total.	Early.	Late.	Total.		Early.	Late.	Total.	Early.	Late.	Total.		
Ascertained	17	11	28	8	1	9	37	21	8	29	5	1	6	35	72
Control	8	2	10	8	2	10	20	3	6	9	6	3	9	18	38
Total	25	13	38	16	3	19	57	24	14	38	11	4	15	53	110

Permanent Separation.

Eliminating temporary separation of all sorts: 76 cases of permanent separation remain—57 in the ascertained group, 19 in the control—i.e. the ratio ascertained to control is 3 : 1. Permanent separation implies more than a change of environment from one or both natural parents to others. If the new environment is less good than the old, it may be its defects which are responsible for the manifestation in the child rather than the change as such.

However this may be, there is a marked association between permanent separation and being ascertained.

Parent from whom Separated.

Examination of the detailed figures shows that the differences between separation from the mother and the father are negligible, i.e., as far as they go, they provide no evidence for the view that separation from the mother produces worse effects than separation from the father.

Date of Separation from Mother.

There is no significant difference between early and late separation from the mother, but the numbers are too small to establish this conclusively.

Date of Separation from Father.

With the same size of group, however, the difference between early and late permanent separation from the father appears to be significant (the chance of the observed difference being due to chance is less than one in 30).

A possible reason for this finding will be suggested later when the results are compared with those of previous workers.

These conclusions are not necessarily inconsistent with the findings of those who hold that early separation, particularly from the mother, causes an outstandingly adverse effect on the development of character. It may be that by taking ascertainment as the criterion, disturbances of character are not sufficiently isolated, since being ascertained depends on a multiplicity of factors, some in the child, some in the home. Factors in the home may account for some of the associations of "permanent separation" with "ascertainment."

Comparisons should therefore be made with regard to the aggressive characteristics previously distinguished, not simply contrasting the ascertained group with the control, but in both ascertained and control group comparing those who have experienced separation with those who have experienced no separation.

Discussion.

Certain factors in the home background have been picked out for study, viz., civil status, condition of the family (i.e., whether the home is intact or broken and, if the latter, then in what way), parental relationships, attitude to child, and finally separation of child from one or both parents for a longer or shorter period.

It is not suggested that these are the only significant factors : some factors that have been noted in a fair proportion of the cases studied, such as mental or physical illness of the parents, have not been analysed separately. The table that follows Table XI sets out twelve factors which singly or in combination play a part in making a home bad. It is not to be supposed that even this list is exhaustive ; many other aggravating factors are known, such as bad relationship between the siblings, friction with relatives and neighbours. and, from time to time, though rarely in our experience, poverty and bad material conditions.

With the limited numbers of the present study, it seems as well to focus attention only on some of the grosser factors.

It will be obvious too, that many of these factors are not independent of one another and, even when it is shown that there is an association between a certain factor and a certain type of maladjusted behaviour, it cannot be supposed that the particular factor is in any precise sense the " cause " of the maladjusted behaviour.

TABLE XI.—*Bad Homes.*

I. *Broken Homes.*

(1) Never established—child illegitimate.
(2) Broken by death of one partner.
(3) Broken by illness—
  (*a*) Physical.
  (*b*) Mental.
(4) Broken by desertion, imprisonment, etc.

II. *Intact but Unsatisfactory Homes.*

(1) Bad marital relationship.
(2) Mental illness of one or both partners.
(3) Physical illness of one or both partners.
(4) Other adverse factors.

III. *Bad Attitude to Child.*

(1) Cruelty.
(2) Hostility or rejection.
(3) Inconsistency, " ambivalence," etc.

IV. *Bad Experiences Irrespective of the Nature of the Relationships in the Home.*

Temporary separation from—
  (*a*) Both parents.
  (*b*) Mother.
  (*c*) Father.

Unfavourable circumstances of different kinds are so frequently linked together : It can rarely be said that one adverse circumstance is responsible ;

rather is it the chain of adverse circumstances which, on the one hand, gives rise to the final pattern of the family and, on the other, provokes in the child behaviour described as maladjusted.

CHAPTER III

Relationships between Aetiological Factors and Symptoms.

In Chapter II an attempt has been made to bring out differences in the home backgrounds of the ascertained and control groups and attention has been drawn to a number of significant differences between the two groups.

But since "ascertainment" does not depend on any one factor and may be recommended because of disturbances in the child, because of disturbances in the home background or (and most commonly) because of a combination of the two, it is an imperfect criterion for the comparison of aetiological factors in the environment.

For this reason an effort has been made to isolate aggression and give a definition according to which the term is to be used.

In this chapter, therefore, use is made of the criterion of aggressiveness in an attempt to assess the relative strength of various factors in the home background in relation to the disturbed behaviour of children.

Aggression as defined in Chapter I will be used for a comparison of sub-groups in the ascertained group with one another and for contrasting the sub-groups of the ascertained with the corresponding sub-groups in the control group.

I. *Intelligence, Age and Sex.*

It has already been noted that much the same proportion of boys as of girls was found to have the aggressive temperament. Neither is there any association between aggressiveness and age, or between aggressiveness and intelligence.

II. *Position in Family.*

Position in family has been shown to be related to the condition of the home and there is no significant relationship between position in family and aggression in either the ascertained or the control group.

Home Background and Aggression.

(1) *Legitimacy, etc., and Aggressive Symptoms.*

In the ascertained group there were 24 illegitimate children and five "doubtful" as against eight illegitimate and one doubtful in the control group. Of the 29 in the ascertained group, 26 showed one or more aggressive symptoms. This proportion is not, however, significantly different from that of the number showing aggressive symptoms among the 71 who were legitimate.

In the control group, on the other hand, the incidence of aggressiveness (i.e., of those showing one or more aggressive symptoms) is much more marked among the illegitimate than among the legitimate and is, in fact, very similar to that in the ascertained group.

(2) *Condition of Family and Aggressive Symptoms.*

It will be seen that in the ascertained group the "condition of the family" has no appreciable relationship to the number of children showing one or more aggressive symptoms.

The relationship between aggressive symptoms and the types of homes distinguished in Chapter II is shown in Table XII. This table displays the distribution of the symptoms aggression, stealing, truanting, destructiveness and encopresis (collectively defined as aggressive symptoms) among the various types of homes in (1) the ascertained and (2) the control group. Table XIII summarizes this material.

The number of aggressive symptoms shown by the ascertained group is more than twice the number shown by the control group, and the predominant characteristic of the ascertained group is aggressiveness of temperament as well as of symptoms. As is only to be expected, the temperament of the majority of the control group is "neither aggressive not dejected," and their symptoms are of a type which indicate psychological conflict, i.e., "compound" symptoms, to use the terminology of Chapter I. For the most part their behaviour is not anti-social. While it would be of interest to pay special attention to the minority of the control group who are severely aggressive (or anti-social or both), the primary concern of this paper is the ascertained group.

For this reason those adverse factors of the home background present in the control group, but *not* present among the ascertained will not be discussed.

Of the ascertained children from "intact" homes, 80 per cent. show one or more aggressive symptoms; of these with one parent only, 90 per cent. show aggressive symptoms; 84 per cent. of those with substitute parents. These slight differences might well have arisen by chance. Since three or four aggressive symptoms were manifested by only eleven children, it is obvious that the number of aggressive symptoms shown (i.e., severe aggressiveness) is not related to differences in the condition of the family.

TABLE XII.—*Condition of Family and Aggressive Symptoms.*

Ascertained Group.

Condition of family.	Aggressive symptoms. A.	S.	T.	D.	E.	Total.	Number in group.	Ratio.
Intact	29	12	3	2	3	49	43	1·14
One parent only	16	2	4	1	1	24	19	1·26
Substitutes	22	14	11	6	6	59	38	1·55
Total	67	28	18	9	10	132	100	1·33

Control Group.

Condition of family.	Aggressive symptoms. A.	S.	T.	D.	E.	Total.	Number in group.	Ratio.
Intact	20	10	4	1	3	38	81	0·47
One parent only	0	1	0	0	0	1	6	0·17
Substitutes	8	5	1	3	2	19	13	1·46
Total	28	16	5	4	5	58	100	0·58

TABLE XIII.—*Condition of Family and Aggressive Symptoms.*

Ascertained Group.

Family.	Number of aggressive symptoms.	Number in group.	Total.
Intact	50	43	1·16
One parent only	24	19	1·26
Substitutes	59	38	1·55
Total	133	100	1·33

Control Group.

Family.	Number of aggressive symptoms.	Number in group.	Ratio.
Intact	38	81	0·47
One parent only	1	6	0·17
Substitutes	19	13	1·46
Total	58	100	0·58

In the control group, on the other hand, there was a marked difference between the children with substitute parents and those living with their own parents (whether one or both) in respect of the percentages showing aggressive symptoms. In this group, one third of children from intact homes show aggressive symptoms as against over two-thirds from homes with substitute parents.

Thus the main differences between the ascertained and control groups are found in children who are living with their own parents. While the control group children who were with substitute parents had a lower ratio of symptoms to numbers, the difference between this ratio and that found in the ascertained group is small.

This point can perhaps be put more clearly thus : In the ascertained group the ratio aggressive symptom per child is almost identical for children coming from intact and from broken homes. In the control group the ratio is three symptoms to four children from intact homes, five symptoms to four children from broken homes.

Relationship between the Parents.

In Table XIV the association is shown between aggressive symptoms and parental relationships.

Table XIV shows that in both ascertained and control groups there is a higher incidence of aggressive symptoms in intact homes where the parental relationship is bad than in those where it is good. In the ascertained this difference is significant but *not* in the control group.

Attitude to Child.

The same analysis has been made in respect of " attitude to child " and is summarized in Table XV. There is a significant association in both ascertained and control groups between unfavourable attitudes and aggressive symptoms, and in the ascertained group the most severely aggressive children are found among those who have experienced cruelty.

Separation.

In the ascertained group separation of any sort or duration was not experienced more frequently by those who showed aggressive symptoms than by those who showed none.

Among those showing aggressive symptoms, however, there was an association between permanent early separation from the father, mother or from both parents and the manifestation of *severe* aggression.

In the control group the one positive association found was between permanent early separation and aggressiveness, though there was no tendency to an association with severe aggression.

Since the numbers in the affected group are small, conclusions based on them cannot be regarded as more than tentative. As far as they go, they would appear to suggest that permanent early separation from either parent has worse effects than later or briefer separations. It must be borne in mind that permanent early separation is often but one link in a chain of disasters: and it cannot be concluded on the evidence available here that separation itself is the damaging factor.

Discussion and Comparison with Previous Work.

Bowlby's basic postulate is that "what is believed to be essential for mental health is that the infant and young child should experience a warm, intimate and continuous relationship with his mother (or permanent mother-substitute) in which both find satisfaction and enjoyment." A state of affairs in which a child does not have this relationship is called maternal deprivation. The numerous studies which Bowlby reviews or makes himself are all directed to showing in one way or another the adverse effects on well-being and character that follow from this condition.

The present study, which had been begun before Bowlby's monograph appeared, can be regarded as another small piece in the mosaic supporting his general thesis. It has become evident in the course of preparing the present paper that the elucidation of the aetiology of maladjustment in children is a very complex undertaking to which no single investigation can make more than a small contribution. Nothing in the present paper is inconsistent with Bowlby's findings or with those of the authors whom he quotes. The analysis made in Chapter II ("Home Background") might be said to extend and amplify Bowlby's concept of "partial deprivation."

The only criticism of Bowlby's work which arises out of the present study is that he emphasizes a negative concept—deprivation—whereas what is revealed in the material reviewed here is the existence of many positive adverse factors in the background of the disturbed child. Hostility and ill-treatment from parents have been shown to have a more damaging effect than ambivalence. Furthermore, separation from parents—on which Bowlby and his colleages put much stress as an adverse influence on mental health—has been found to have significantly adverse effects only when it is early and permanent. Temporary separation, either before or after the age of four, was not found to be

associated with the manifestation of aggressive symptoms, nor was permanent separation which began in the fifth year of life or later.

What seems to emerge from the material studied here is that there is no one type of misfortune which, judged by the reactions of the child, is in itself significantly worse than another; what is damaging is a series of misfortunes. Many of the misfortunes are, however, of the sort that engender other misfortunes. Permanent separation from the parents is of this sort; temporary separation for the most part, is not. It is clear from the studies quoted by Bowlby that this is the case and that he would be far from denying it. His concept of "maternal deprivation" does not make this immediately apparent, and is, to that extent, an over-simplification.

A further point of apparent inconsistency between the results of this study and of Bowlby's is that permanent early separation from the father is here shown to be no less adverse in its results than permanent early separation from the mother. Bowlby stresses the importance of the mother-child relationship and relegates the father to a secondary role in relation to the child; his value is as the "economic and emotional support of the mother" which enables her to "maintain that harmonious contented mood in the aura of which the infant thrives." In view of this, the finding that separation from fathers is as disadvantageous as separation from mothers was unexpected. A possible reason, however, is that when a child is separated from his mother, some woman is soon found to care for him and often becomes a permanent substitute. A mother left with a young child will often try to care for him in spite of having to work long hours to maintain her family. She will resort to makeshift arrangements, and there may well be more change and more disturbance for the child than if a substitute mother had taken immediate charge.

It cannot be inferred from what has been said above that temporary separation is without adverse effects. Many children in the control group were suffering quite severely from mental ill-health, the treatment of which required much time and skill. It is maintained in this paper, however, that on the whole the control group were less seriously ill than the ascertained group, and that, although temporary separation produces some adverse effects, it is not among the factors producing the worst effects.

Neither Bowlby, nor any of the authors whom he quotes, discuss the positively adverse effects that appear in children with substitute parents, but Spitz (1952) has drawn attention to what he calls the "psychotoxic diseases of infancy" and suggested that they are no less important than those resulting from deprivation. The evidence collected in the present study is in accordance with this view, and seems to call for a much fuller analysis than has been made here. In this, as in so many other respects, the conclusions of this paper cannot be regarded as more than tentative.

Combination of Adverse Factors in the Home Background.

The analysis so far made has pointed to four aetiological factors which are significantly associated with the manifestation of aggressive behaviour in children—viz., transfer to the care of substitute parents, character of the rela-

tionship between parents, of their attitude to the child and separation of child from one or both parents.

TABLE XIV.—*Parental Relationships and Aggressive Symptoms.*

Relationship.	Aggressive symptoms. A.	S.	T.	D.	E.	Total.	Number in group.	Ratio.
Ascertained:								
Bad	21	10	3	2	2	38	30	1·27
Good	8	2	0	0	1	11	13	0·85
Total	29	12	3	2	3	49	43	1·14
Control:								
Bad	3	3	3	0	1	10	15	0·67
Good	6	3	1	0	2	12	40	0·30
Total	9	6	4	0	3	22	55	0·40

TABLE XV.—*Aggressive Symptoms and Attitude to Child.*

Ascertained (99 cases).

Attitude.	Number of aggressive symptoms.	Number in group.	Ratio.
"Good"	9	12	0·75
"Bad"	70	55	1·40
Cruel	51	32	1·60
Total	130	99	1·31

Control (70 cases).

Attitude.	Number of aggressive symptoms.	Number in group.	
"Good"	10	32	0·31
"Bad"	24	35	0·69
Cruel	0	3	0·00
Total	34	70	0·41

From the analyses that have been made it can be seen that, in the ascertained group, at least one of the adverse factors referred to in this chapter was affecting all but two of the children characterized as aggressive. Each of these two children was regarded as suffering from an endogenous maladjustment—the one a case of birth injury with multiple physical and mental disabilities, the other a psychotic child (whose parents. though united and devoted to him, were distinctly schizoid themselves).

In the control group there were four aggressive children who were not affected by one of these adverse factors. One was herself an epileptic and spastic child, but too old when seen to be provided with special educational treatment; one was in the care of a mother who suffered from chronic physical and mental ill health; the father of the third was a chronic invalid and thought likely to die; the fourth had a pleasant Frenchwoman for a mother who was, however,

described by the psychiatric social workers as " a bit at sea with English standards " (in consequence of which the child was too).

Conclusions.

While it has not been possible to establish the relative importance of different aetiological factors in relation to aggressive behaviour, the following facts have emerged.:

There is a good deal of consistency between the results obtained by examining the control group and examining the ascertained group. As there are fewer aggressive children in the control group, it is only to be expected that there will be fewer in any limited section of it than in the corresponding section of the ascertained group. Given this expectation, the findings among the control group support those of the ascertained group as regards the association between the manifestation of aggression and—

(1) character of the parental relationship,
(2) attitude to child,
(3) permanent early separation of child from one or both parents,

and seem to put special emphasis on illegitimacy and transfer to the care of substitute parents.

These aetiological factors cannot be directly compared with one another because of the overlap between the classes. When analysing a series of 100 ascertained and 100 control cases the numbers diminish at each successive stage. Some of the desired analyses remain unmade because it would only be misleading to compare very small groups. Further comparisons are, therefore, desirable using groups of a size to permit of the isolation of each separate aetiological factor.

Nothing so far considered accounts completely for the differences between the control and ascertained groups. Throughout, the aggressive responses of the control group are less intense than those of the ascertained. One possible reason for this finding would be that different standards had been applied to the groups. This seems unlikely on grounds already referred to and it seems most improbable that a systematic error of this sort could be sustained throughout the numerous groups into which the two main groups have been classified.

Two other hypotheses remain : (1) That there is some additional environmental factor or factors in the background of the ascertained group that has not been observed ; (2) that some or all of the individuals composing it have a particular tendency to re-act aggressively.

Both may be true.

In the environment there is an infinity of influences from which only a few of the most obtrusive have been selected for investigation, though it is hoped that no gross environmental factor has been overlooked.

It is tempting to postulate some inherent or constitutional predisposition to aggressive behaviour which is called forth in the susceptible by a smaller stimulus than in the majority of children. Clinical observation of some, at least, of the ascertained group lends colour to the belief, and evidence is accumu-

lating to establish the presence of cerebral dysrhythmias in many aggressive children.

It is impossible to work on material such as that reviewed here without becoming aware of many shortcomings and inadequacies. The most that can be said for a study of this sort is that it serves as a pilot survey ; that it draws attention to many complex issues in need of clarification, and shows the need for an extension of research on a larger scale into a number of more limited but better defined problems.

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ON THE NATURE, ORIGIN AND DISTRIBUTION OF THE CORPORA AMYLACEA OF THE BRAIN WITH OBSERVATIONS ON SOME NEW STAINING REACTIONS.*

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Corpora amylacea (C.A.) or amyloid bodies found in the brain and the product of amyloid degeneration in other organs derive their name from the starch-like reaction which they give with iodine (Virchow); otherwise these substances have few points in common, and while amyloid disease has become fairly rare nowadays, the presence of C.A. constitutes one of the regular changes in senile and senescent brains. This is perhaps why it has attracted much less attention than amyloid degeneration. For instance in 18 out of 25 papers, containing detailed accounts of the histo-pathological pictures, I found no references to C.A., yet one could hardly assume that amyloid bodies were overlooked. Most text-books pay scanty attention to the subject, while Buzzard and Greenfield (1921) consider it of no pathological significance. Since, however, C.A. are encountered under a variety of conditions (not merely senility), in greatly varying amounts and at different sites in the central nervous system, it may be worth while to investigate their nature, origin and occurrence in the light of recent observation.

C.A. are extracellular spherical or ovoid bodies, 10 to 40μ in diameter, staining with iodine, silver nitrate and in characteristic ways with certain basophil dyes; they show either a laminated or more or less homogeneous structure with a dense centre and a paler periphery, thus suggesting the existence of different forms. They are often impregnated with calcium and iron salts but do not contain lipids, phosphatides (Bravi, 1947) or cholesterol (Turner, 1946).

While C.A. differ from ordinary amyloid both physically and chemically, these substances both have certain points in common, and since the latter material has been more thoroughly studied, especially by Schmiedeberg and his collaborators (1921), a comparison between the two is likely to lead to a better understanding of the nature of C.A. For a detailed account of the clinical pathology and classification of amyloid degeneration the reader is referred to the articles by King (1948) and Goldberg (1950).

Amyloid and Corpora Amylacea Compared.

1. *Chondroitin sulphuric acid* (*C.S.A.*).—Hanssen (quoted from Schmiedeberg) investigated amyloid in pure form which he isolated from the sago-granules of amyloid spleens by mechanical means. It is of course impossible to adopt this method with C.A., scattered as they are through the tissues.

* Awarded the Bronze Medal for 1953 of the Royal Medico-Psychological Association.

Amyloid is a compound of C.S.A. and a protein named by Schmiedeberg "Hyaloidin" and first prepared by him from the walls of hydatid cysts. C.S.A. belongs to the class of muco-polysaccharides and, although there is no specific histological or microchemical test for the acid, it gives the Hotchkiss reaction (*v. infra*) like hyaluronic acid. C.S.A. is formed as a by-product when protein is converted—perhaps through enzyme action (Payling Wright, 1950)—into collagen; hence it is found in collagen material such as connective and supporting tissues, possibly in neuroglia and perhaps therefore in C.A. which are usually found in areas of gliosis.*

By determining the relative amounts of sulphuric acid in normal and amyloid organs Hanssen showed that normal spleen contains an average of ·029 per cent. sulphates against ·119 per cent. in the case of amyloid spleen. Since C.S.A. contains 5·82 per cent. sulphates it follows that amyloid spleen contains 1·5 per cent. C.S.A. and the normal organ ·09 per cent. C.S.A. Hanssen also found an increase of C.S.A. in amyloid liver which does not represent pure amyloid.

An evaluation of the contents of sulphates in brain tissues with and without deposits of C.A. might likewise give some information as to the presence of absence of C.S.A. in the cerebral amyloid bodies.

2. *The Hotchkiss reaction.*—in the reaction described by Hotchkiss (1948) use is made of an oxidant, periodic acid, to convert polysaccharides into high molecular aldehyde compounds, which stain intensively with fuchsin sulphurous acid (Schiff's reaction). In addition to C.S.A. other polysaccharides, e.g. glycogen and certain lipids, give the Hotchkiss reaction so that when these have been removed, "the test becomes more or less specific for muco-polysaccharides such as C.S.A. and glycoproteins" (Catchpole, 1952). I found that both ordinary amyloid (from liver, kidneys, spleen) and C.A. give a well-marked positive Hotchkiss reaction.

3. *Digestion.*—C.A. are dissolved like amyloid by weak alkalis, while resisting digestion with pepsin and HCl; they remained unchanged after 24 hours' digestion in a 10 per cent. solution at 37°. Neither amyloid nor C.A. are affected by the diastatic ferment in saliva.

4. *Staining reactions.*—Amyloid and C.A. both give the same staining reaction with iodine; this is best performed with Lugol's solution after treating sections with a 1 per cent. solution of acetic acid for one minute. When concentrated sulphuric acid is added subsequently both substances turn from brown to greyish blue. C.A. stain more deeply than amyloid; I also found that where the reaction is delayed, it will appear fully developed the next day in sections mounted in a water medium. The iodine reaction is equally well obtained after alcohol, formalin or mercurial fixation, and also in tissues preserved in formol-saline for over a year. The stain likewise keeps for a long

* C.A. of the prostate and the lungs are not considered here; the former, studied in detail by Moore and Hanzel (1936), are contained in the gland lumina, the latter in the alveoli while the amyloid bodies of the brain are found in the interstitial spaces of the parenchyma. H. D. Steele *et al.* (1952), who have recently investigated the polysaccharide nature of C.A., showed that those of the central nervous system differ likewise chemically from amyloid material found in the lungs and the prostate.

time in watermount specimens, although the remainder of the sections fades unless counterstained. The reaction is not affected by decalcification nor digestion.

The remaining reactions are summarized in the following table :

Stain.	Amyloid.	Corpora amylacea.
Methyl violet Gentian violet Methyl green Toluidine blue	Meta-chromasia: Red / ,, / Violet / Red	Natural colour: Violet / ,, / Green / Varies
Congo red	+	–
Haematoxylin and eosin	Pink	Mauve
Mallory's connective-tissue stain	Blue	Varies
Azan stain for C.N.S.	Bright blue	Bright blue
Unna's differential starch stain	Red	Red

Both substances stain black with Bielschowsky's silver impregnation.

Schmiedeberg suggests that the characteristic colour reactions are due to the hyaloidin component or to a derivative of the same. C.A. which do not stain metachromatically with methyl-violet (methyl-green, etc.) therefore resemble newly-formed amyloid (*"junges amyloid"*) which does not show metachromasia.

A peculiar form of amyloid called by Klebs (quoted from Schmiedeberg) "achromatic," has the typical appearance of ordinary amyloid but without giving the characteristic colour reactions ; it can be produced out of the natural substance by treating the latter with an alkali (e.g., baryta water). Achromatic and other forms giving one or the other colour reaction seem to point to the existence of different types of amyloid ; Schmiedeberg mentions no less than eight, whereas Weil (1946) distinguishes different types of C.A. in the brain. Finally Leupold (Schmiedeberg) has produced an amyloid-like substance out of normal spleen which he autolysed in sulphuric acid for several weeks ; it had a hyaline appearance, gave the iodine reaction, but did not stain metachromatically with methyl-violet, thus showing characteristics of C.A. I have not been able to produce the same material out of normal brain tissue.

The last two stains given in the table are a recent addition. With my special Azan stain for the nervous system, amyloid and C.A. both appear bright blue on a red background ; in some bodies the laminated structure is clearly seen (Fig. 1).

The affinity of all amyloid material for iodine suggested to me a trial with other starch colour-reagents. I have therefore made use of the differential starch stain described by E. Unna (1918), with the result that both amyloid and C.A. were found to stain in the same way as potato-starch granules. It is interesting to note that colloid material in the renal tubules and interstitial spaces of an amyloid kidney stained like gluten (albuminous portion of wheat). Unna's original illustrations reveal a laminated appearance and a pale peripheral zone in the potato granule, reminiscent of the similar structure of C.A. (Fig. 2).

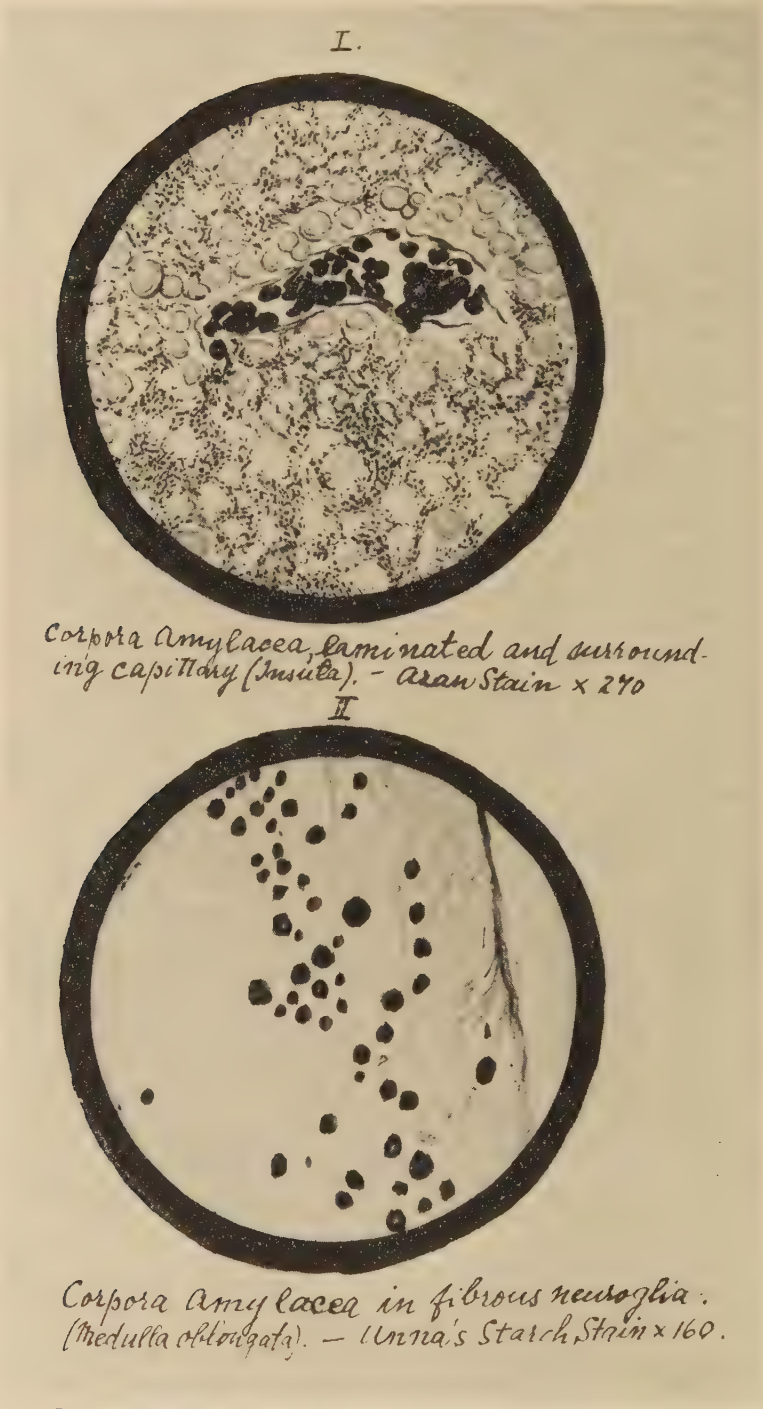
I.
Corpora amylacea, laminated and surrounding capillary (insula). - Azan Stain x 270
II
Corpora amylacea in fibrous neuroglia. (Medulla oblongata). - Unna's Starch Stain x 160.

FIG. 1.—Corpora amylacea, laminated and surrounding capillary (insula). Azan stain. × 270.

FIG. 2.—Corpora amylacea in fibrous neuroglia (medulla oblongata). Unna's Starch stain. × 160.

From these reactions it is possible to draw the following conclusions :

C.A. consist like amyloid of two components, a polysaccharide corresponding to the chondroitin sulphuric acid in amyloid and giving the Hotchkiss reaction and a protein component corresponding to Hyaloidin which is responsible for the characteristic colour reactions.

Material and Methods.

The investigation has been carried out on 12 brains from bodies between the ages of 55 and 87 years (see table p. 695). In addition to the standard methods the following staining reactions have been employed ; (1) *The Hotchkiss reaction* follows the directions given by R. D. Hotchkiss in his article on the " Staining of Polysaccharides Structures in Fixed Tissue Preparation." (2) The author's *Azan stain for the C.N.S.* method :—(*a*) Wash formalin fixed sections in aq. dest. (*b*) Stain in Azan stain I (Gurr) for 45 minutes at 56–60 C. (*c*) Wash in water. (*d*) Differentiate in 0·1 per cent. aniline in 90 per cent. alcohol. (*e*) Wash in glac. acet. acid 1 per cent. in 96 per cent. alcohol. (*f*) Mordant in 5 per cent. aqueous phosphotungstic acid for 2–3 hours until decolorization. (*g*) Wash rapidly in water. (*h*) Stain in aniline blue-orange G acetic (Gurr), stock solution diluted 1 : 15, overnight up to 12 hours. (*i*) Wash in aq. dest. (*j*) mount and treat rapidly with acetone. (*k*) Wash in aq. dest., dehydrate, mount in balsam. (3) *E. Unna's differential starch stain* :—Thoroughly washed frozen or paraffin sections brought down to water are placed in 3 per cent. phenol for 24 hours Material : (*a*) Unna's waterblue-orcein ; (*b*) alcohol-sol. eosin 1 per cent. in 60 per cent. alcohol ; (*c*) aqueous saffranin 1 per cent. (*d*) pot. bichromate 0·5 per cent. Method : (1) To 1 gm. (*a*) add 3 drops (*b*). (2) Transfer sections to this fresh mixture for at least 10 minutes. (3) Wash in tap water. (4) Stain in (*c*) for 15 minutes at room temperature. (5) Wash thoroughly in tap water. (6) Place in (*d*) for 20 minutes. (7) Wash, dehydrate, mount in balsam.

Distribution.

C.A. usually occur in areas of gliosis and in close relation to capillaries, especially in the pia and choroid plexuses, although those found here are of a different type.

In studying the distribution of the amyloid bodies of the brain, we must distinguish between the changes due to *ageing* and those brought about by *pathological processes*. C.A. found in senile brains have a predilection for certain regions such as the hippocampus, ependymal zones of lateral and third ventricles (Bravi), floor of fourth ventricle, medulla oblongata and cord, where they are encountered in large or small clusters ; they appear sporadically both in grey and white cerebral tissue, occasionally in the basal ganglia, rarely in the cerebellum. In certain pathological conditions there is often a considerable increase of C.A. both at the site of the lesion and/or widespread throughout the C.N.S. They occur in areas of arteriosclerotic softening, where demyelinization is followed by microgliosis in subacute combined degeneration (Kinnier Wilson, 1940) or clustering around vessels and surrounded by glia in tabetic cords (Favorski, 1918). In a case of status epilepticus which terminated fatally at the age of 48, Wyllie (1937) found closely packed patches of C.A. in the precentral convolutions, the temporal lobes and the junction of cord and medulla but nowhere else. Though they are not related to cholesterol, deposits of C.A. were seen by Turner (1946) in a case of generalized xanthoma (cholesterol tumour) in areas of subendymal gliosis and surrounding the capillaries through-

out the basal ganglia. A noteworthy feature of C.A. is described by Waltner (1947) as occurring in the cochlear aqueduct and neighbouring structures occasionally at the early age of three, regularly in subjects over six years. From these findings he concludes that age is *not* the sole factor in the formation of C.A.

The nine purely senile brains that I examined showed deposits of C.A. practically confined to the above-named sites ; only occasional small groups or merely isolated bodies appeared in other regions ; small numbers were seen fairly regularly in the pons (fifth nerve tract), and in one case an excessive amount occurred in the temporal lobe. In the hippocampus C.A. are mainly located in the alveus, fimbria and dentate fascia. Their constant presence here suggested a search in other parts of the olfactory system, and I was not surprised to find them also in fair numbers in the olfactory bulb, tract and trigone. In the medulla—level of the mid-olives—the bodies were most numerous in the floor of the fourth ventricle, nuclei gracilis and cuneatus, scattered over other parts and more sparsely distributed over the pyramids. The cord presented a similar aspect at all levels, the bodies prevailing in the tracts of Goll and Burdach.

C.A. showed a considerable increase in numbers and a much wider distribution in true pathological lesions of the C.N.S. Almost every part of the brain was affected in the following three cases :

Case 1.—M. C—, male, aged 55. G.P.I. Cortical atrophy, extensive necrosis in centrum ovale, gliosis and vascular changes.

Case 2.—W. C—, male, aged 78. Senile dementia and traumatic epilepsy. Depressed frontal scar, atrophy right frontal lobe, partial hydrocephalus.

Case 3.—L. F—, male, aged 67. Presenile dementia.

Origin.

The cause and formation of C.A. are still the subject of conjecture. Age and wear and tear are accepted as factors by most workers ; other causes are trauma, infection, and circulatory disturbances, all more or less connected with gliosis. According to an old theory C.A. are precipitated from C.S.F., which would explain their frequent occurrence in the walls of the ventricles.

The neurogenic theory, opposed among others by Mutalimow (1933), may be disregarded. It is true that so-called amyloid globules are found in the cytoplasm of nerve-cells in myoclonic epilepsy, that "excessively rare disease," but these structures have nothing to do with C.A. Again it is remarkable that senile plaques, which are composed of debris of ganglion cells, fibrils and glia cells, do not harbour C.A., although they sometimes contain granular argyrophil substances in the centre which stain for amyloid (Biggart, 1950 ; Ferraro, 1939).

According to the gliogenic theory—first advanced by Cajal—C.A. are said to originate in neuroglia ; at first believed to come from oligodendroglia, it is now thought that their close relation to fibrillary astrocytes points to the latter as their source (Courville, 1950). Although H. D. Steele *et al.*, (1952) point out that the absence of nucleic acid in C.A. does not support the idea of a cellular origin, yet they do not consider it to be definite proof to the contrary, since nucleic acid may be lost in the formation of C.A.

Case.	Frontal lobe.	Temporal lobe.	Occipital lobe.	Precentral G.	Postcentral G.	Insula.	Int. capsule.	Ext. capsule.	Nuc. caudat.	Putamen.	Glob. pallidus.	Thalamus.	*Hippocampus.*	Pons.	Cerebellum.	*Medulla oblongata.*	*Floor 4th ventricle.*	*Med. spinalis.*
1. C. R—, M., 59; imbecile	o	o	o	o	o	o	S.	S.	S.	S.	o	S.	+	—	S.	+	+	++
2. S. M—, F., 87; senile dement, frontal meningioma	o	o	o	o	o	o	o	o	S.	S.	V.S.	V.S.	+	o	o	+	+	++
3. M. G—, F., 87; senile dement	o	o	o	o	o	o	o	o	S.	S.	V.S.	V.S.	+	o	V.S.	++	++	+
4. J. D—, F., 85; senile dement; hemiplegia	o	V.S.	V.S.	o	o	V.S.	V.S.	V.S.	V.S.	V.S.	V.S.	V.S.	+	V.S.	V.S.	++	+	++
5. M. C—, M., 55; coronary thrombosis	o	V.S.	o	o	o	o	o	o	o	o	o	o	+	o	o	V.S.	V.S.	V.S.
6. S. A—, M., 78; senile dement	o	++	o	o	V.S.	V.S.	++	++	V.S.	+	+	V.S.	++	V.S.	V.S.	+	+	+
7. A. P—, M., 87; senile dement	o	V.S.	V.S.	+	V.S.	V.S.	+	+	—	V.S.	V.S.	S.	+++	S.	S.	++	+	+
8. M. Cz—, M., 55; syphilis, carcinoma of stomach	+	—	V.S.	V.S.	V.S.	—	—	—	—	—	—	—	+	+	V.S.	++	+	++
9. H. M—, M., 75; senile dement, TB.	o	o	o	o	o	o	o	o	o	+	o	V.S.	+	V.S.	V.S.	S.	+	+
10. M. C—, M., 55; *v.* Case 1, p. 694	} Profusion of corpora amylacea throughout brain and cord.																	
11. W. C—, M., 78; *v.* Case 2 ,,																		
12. L. F—, M., 67; *v.* Case 3 ,,																		

Symbols: o = absent; S. = scanty; V.S. = very scarce; — = not examined.

Mutalimow considers that C.A. are derived from *both* glia cells and C.S.F. or interstitial fluid. The latter flows around ("*umspült*") degenerated cellular material, causing a swelling of the amyloid bodies and their subsequent formation in layers. This twofold cellular and humoral origin represents reactive and degenerative changes, and in many cases the "bio-reductive phenomenon" of advancing age.

Discussion.

C.A. and amyloid degeneration are not due to the same causes. That the latter condition can occur in the brain has been demonstrated by Benedict and McGovern (1949), who have described widespread amyloid changes in vessels of the cortex in a case of presenile dementia*; Peters (1949) on the other hand, found local amyloidosis in a case resembling multiple sclerosis.

The dual origin explains perhaps most likely the formation of C.A., especially when based on a study of their distribution in conjuction with vascular changes. Gordy and Smith (1930) have shown that the haemato-encephalic barrier has a selective permeability towards substances in the general circulation; there is no obstacle in the opposite direction. Permeability changes under certain pathological conditions, e.g., it is increased in G.P.I., cerebral atheroma or with hypertension and insufficient blood supply (Aviosor, 1938), all conditions to be found in senile brains. The formation of C.A. may be connected with the cholesterol content in plasma in so far as this produces athero-sclerosis; whether the formation of C.A., like amyloid degeneration is associated with an excess of plasma globulin is not known. The problem of the predilection of C.A. for certain regions is still unsolved; as A. Meyer (1938) has pointed out we know very little about the causes for the susceptibility of vulnerable areas for selective lesions. He has drawn attention, *inter alia*, to the vulnerability of the cornu ammonis, and it is here that we regularly find deposits of C.A.

The peculiar blood supply of the spinal cord in which as Bolton (1939) observes, the posterior columns and roots are separated from the anterior and lateral columns may account for the predominance of C.A. in the tracts of Goll and Burdach.

Thus the study of C.A. sets a variety of problems, and if they cannot all be solved at present, their very statement may in itself prove of value.

Summary.

C.A., like amyloid, represent a compound of protein and polysaccharide. The chemistry of amyloid is reviewed and compared with that of the amyloid bodies of the brain by the usual methods and by three recent staining reactions (Hotchkiss reaction, author's Azan stain and Unna's differential starch reaction). The dual origin of C.A., their distribution and predilection for special regions of the C.N.S. is described, stress being laid on the marked increase of C.A. under pathological conditions.

* Compare Case 3, above.

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DISORIENTATION FOR AGE.

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It has often been noticed that patients in amnesic states are prone to under-estimate their age. In cases of Korsakov's psychosis this under-estimation may be very gross, and its extent appears to be determined, in part at least, by the duration of retrograde amnesia (Meggendorfer, 1928). A similar, if less extreme, under-estimation of age may also occur in the early stages of recovery after head-injury. In a recent study Weinstein and Kahn (1951) refer to this phenomenon as *disorientation for age* and adduce some striking examples. Thus one of their patients, a woman of over 70, insisted that she was 38. These authors do not, however, attempt a systematic analysis of this facet of disorientation.

In studies of amnesia extending over some years the present writer has been much struck by the frequency of disorientation for age in both acute and long-lasting amnesic states. In the latter, particularly, the phenomenon is often extremely stable, and may be maintained over long periods with the utmost tenacity. One may therefore suggest that it constitutes more than a simple memory deficit and warrants treatment as a phenomenon of denial akin to anosognosia (Weinstein and Kahn, 1950). At all events, one may argue that this aspect of disorientation has been unduly neglected and merits more systematic inquiry.

In the present paper two cases of Korsakov's psychosis will be described in which disorientation for age was remarkably persistent and stable. Although the observations were made some years ago, it is felt that the contemporary renewal of interest in problems of orientation (cf. Paterson and Zangwill, 1944 ; Levin, 1945 ; Weinstein and Kahn, 1951 ; Hécaen and Ajuriaguerra, 1952) justifies their tardy communication.

Observations.

Case 1.—A labourer, aged 55, was admitted to hospital in October, 1939, following an acute delirium of sudden onset. On admission he was confused and disoriented in all spheres, and with a moderate degree of peripheral neuritis. There was a history of chronic alcoholism of many years' duration. When first seen by us three months after onset of the psychosis, the patient had recovered his orientation for time and place but recent memory was grossly defective. There was a diffuse but extensive retrograde memory defect. Confabulations were somewhat scanty.

The patient could state his *year of birth* (1884) correctly on request and had no doubt that the present year was 1940 (correct). Yet he invariably maintained that his age was 39, and this error resisted all attempts at correction. Thus when the patient was asked his age in 1894, 1904 and 1914 respectively, he would always

answer correctly. When, on the other hand, he was asked his age in 1924, he became evasive and would usually reply " about 30." When we gave the patient a chart with the years from 1884 to 1940 set out in chronological sequence, he agreed at once that the first year was his year of birth and the last the current year. If asked to write his age against each year on the chart, he would respond correctly up to 1924, at which point his attitude would suddenly change. Thus he might exclaim incredulously: " I'm not so old, you see ! " If forced to continue after 1924, it was plain that the figures he wrote carried no conviction in his mind. Although the logic of the procedure was never questioned, it convinced him only in the case of the earlier years. If pressed, he might say that he was 55 " according to that paper " but " actually " only 39. This procedure was repeated many times and always gave the same result. No change in the patient's conception of his age or in his tendency to deny his true age was noted during a six-month period of observation.

Case 2.—A woman, aged 56, was admitted to hospital in June, 1939, in a grossly confused condition. Her memory was severely impaired and she confabulated freely. She made frequent mistakes of identity and was disoriented for space and time. The patient was in poor physical health, with peripheral neuritis in both legs.

At the time this patient came under our observation (February, 1940) her orientation for time and place had recovered and she could always give the current year on request. When asked her age, however, she always said that she was in her 47th year, despite the fact that she could give her date of birth (22 July, 1883) whenever asked. The patient could readily subtract 1883 from 1940, but categorically denied that the resulting figure could have anything to do with her age. Very occasionally she could be brought to admit that her age must be 56 (" Figures speak for themselves ", as she would put it) but this fact was forgotten almost at once and the disorientation for age would reassert itself.

With further general improvement in mental state, orientation for age became gradually restored. In May, 1940, the patient might remark that " others had told her " that she was 56 although she still believed her age to be only 46. Experiments with a chart, similar to those conducted with Case 1, would now convince her for a short time of her true age, and this would be remembered for the remainder of the interview, though not from one day to the next. When asked her age on one occasion the patient remarked: " We had this all out before. I remember seeing it all written down." None the less she still gave her age as 46. In June, 1940, correct orientation for age was re-established. Thus when asked her age she said: " According to what you said it seems that I'm in my 57th year. I suppose I said I was 47. I don't feel my age." A few days later her reply was: " I must be in the latter part of the 50's—my 57th year, I suppose. I told you wrong before. It came as a big shock to me. In fact I can scarcely grasp it." Thereafter, orientation for age was maintained without relapse until discharge.

Comment.

The phenomenon of *disorientation for age* is clearly displayed in both these cases of alcoholic Korsakov psychosis. In Case 1 the patient consistently underestimated his age by 16 years, and this disorientation was maintained with complete fixity during the six months in which he was under our observation. In Case 2 the patient under-estimated her age by 10 years at first, but this disorientation gradually cleared up in the course of recovery. Both patients knew their respective dates of birth and could give the current year without mistake. Yet neither could make use of these items of information in correcting the disorientation. Indeed it is not too much to say that both patients actively denied their true ages even when confronted with conclusive evidence which they had themselves supplied. The disorientation was fixed, stable and impervious to logical correction.

This tendency to maintain a fixed disorientation in the teeth of contradictory evidence may be regarded as a special case of the entertainment of incompatible propositions in amnesic states to which attention was first drawn by Pick (1915). Despite the fact that both patients could easily perform the simple calculation required to ascertain their respective ages, neither could relate the information thus obtained to the content of the disorientation. Although the logic of the procedure was never disputed, it failed to carry any real conviction and was immediately discounted.

The attempts which were made to re-establish correct knowledge of age have a parallel in observations on the recovery of orientation in other spheres. Thus Paterson and Zangwill (1944), in studying the recovery of spatial orientation after head injury, drew attention to cases in which correct and incorrect ideas of locality might flourish side by side, apparently unrelated, or become reconciled through bizarre and facile rationalization. Several of their patients stated that they were in one place (the true locality) "according to the map" but "actually" somewhere quite different. The parallel with Case 1, who stated that he was 55 "according to that paper" but "in fact" only 39 is very striking. Again, Paterson and Zangwill observed that patients in process of recovery might allege that what *they* called their present whereabouts *others* called by some quite different name. This has a parallel with the behaviour of Case 2 when she remarked that "others had told her" that she was 56 though "in fact" she was ten years younger. It would appear, therefore, that conflicting data in regard to age may be reconciled in the same facile and unrealistic manner as are conflicting data in other spheres of personal orientation.

We may now consider briefly the main psychological factors governing disorientation for age. In the normal person, knowledge of age is of course given by arithmetical reasoning. But one may surmise that an individual's conception of his own age is not wholly grounded in logic. The possession of a coherent body of memories, organized chronologically, serves to endow this conception with substance and reality. Now neither of our patients could recall, in connected form at least, events dating from the 10 years or so prior to onset of the illness. Although both were formally orientated for place and time, it is likely that both were treating the current situation, in part at least, in terms of attitudes appropriate to an earlier period of their psychological history. There is no reason to suppose that such attitudes were not likewise entertained by the patients towards themselves. In short, it appears likely that the patients were assessing their ages in accordance with the scope of the retrograde amnesia, and that the latter can be regarded as the principal factor governing the disorientation.

Such an explanation does not, however, fully account for the tenacity of the disorientation or the resistance encountered when attempts were made to dispel it. Amnesia is a negative deficit, and it is difficult to see how it can constrain positive phenomena of denial. One may therefore suggest that, in addition to amnesia, a motivational background should be sought. In other spheres of orientation there is good reason to believe that motivational factors may be relevant (Paterson and Zangwill, 1944; Weinstein and Kahn,

1951), and, in the case of age, such factors may well acquire proportionally greater importance. In the first place, sensitivity with regard to advancing age is a common human failing (especially among women), and emotional disinclination to accept its full import is often strong. There is every reason to suppose that a factor of this kind may reinforce the disorientation in amnesic states. In the second place, one may argue that the amnesic patient has perforce to develop as adequate an orientation towards both himself and his milieu as his damaged brain permits. Now his lack of insight into the amnesia will obviously constrain him to interpret the present in the light of the past and, under such circumstances at least, under-estimation of age is a consistent psychological response. If, however, the patient is acquainted by others with his true age a fresh inconsistency arises. This can be resolved only by admitting the full extent of the retrograde memory defect on the one hand, or by denial of the true facts on the other. As the first solution is well outside the limits of tolerance of most patients, it is not surprising to find that the second is adopted. Denial of age, therefore, may be viewed as a protective reaction, which enables the amnesic individual to maintain as stable and consistent an orientation towards himself and his situation as his cerebral condition permits.

Summary.

(1) Two cases of Korsakov's psychosis presenting disorientation for age are briefly described. Age was under-estimated by 16 years in the first case and by 10 years in the second; in both, the fixity and tenacity of the disorientation were very pronounced.

(2) Some psychological factors governing disorientation for age are briefly discussed.

These cases were studied in association with the late Dr. Andrew Paterson.

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AN INVESTIGATION INTO THE SUPPOSED DIFFERENCES EXISTING BETWEEN MONGOLS AND OTHER MENTALLY DEFECTIVE SUBJECTS WITH REGARD TO CERTAIN PSYCHOLOGICAL TRAITS.*

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Introduction.

Mongolism was one of the earliest syndromes to be recognized as a specific type of mental deficiency and was first described as such by Langdon Down in 1866. The term "mongol" was applied to this type of defect by Langdon Down on account of the superficial facial resemblance he observed in its subjects to individuals of the Mongolian race.

Many writers have stated that mongols exhibit to a conspicuous degree certain mental and emotional traits which are as characteristic of the type as are the physical stigmata, and the general impression is given that they are almost invariably lovable little creatures with very attractive peculiarities and few, if any, of the bad behaviour traits and undesirable habits so commonly found amongst other defectives.

Perhaps the most widely read description of mongolism, at any rate in this country, is that given by Tredgold in his standard textbook, *Mental Deficiency*. On account of its familiarity to most medical practitioners and students, to psychologists and others who work in this field, this description may be quoted verbatim as far as the traits in question are concerned.

"The mental characteristics of mongols," it states, "are not nearly so distinctive as the physical; nevertheless, as a class they present certain general features. In infancy many of them tend to be placid and inert, and the mother is apt to congratulate herself upon the goodness of her child; others, however, are restless and constantly grimacing. But in all there is retardation of mental development, and sitting up, walking and talking are all markedly delayed. . . . For a time, as the child grows up, he becomes less inert and shows more curiosity; he is attracted by everything round him, is full of initiative, is very observant, and looks bright and intelligent; he is very fond of drill and dancing, and shows an aptness for mimicry, a marked sense of rhythm, and a remarkable fondness for music. In spite of this promise the passage of time only serves to make his defect more prominent, and he is gradually left further and further behind by his normal brothers and sisters. But he remains of a happy and

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cheerful disposition; he is affectionate, good-tempered and easily amused; he likes to be taken notice of, and he is usually a great favourite with all who have to do with him. The mongol may be mischievous and given to childish pranks, but it is very rare to find him guilty of bad temper or of any of the vices or bad habits which characterize so many of the ordinary defectives."

Since Langdon Down's original description of mongolism, and especially since the beginning of the present century, a vast amount of attention has been given to the subject, and the literature, already profuse, is still accumulating. Most of the work which has been done concerns the physical aspects of the condition; the anatomy, genetics, aetiology, and general pathology, and the various sociological problems involved. Many studies have been made of the mental ability of mongols and much invaluable data collected. With all this the present paper is not concerned. It is, however, rather remarkable to find so little space devoted in the works of almost every writer on the subject to the emotional and behavioural aspects of mongolism. Such information as is given is in the nature of general observations, supported occasionally by brief histories of particular cases which are said to be typical. Many discrepancies and even contradictions are found, and a good deal of plain borrowing by one writer from another would appear to be obvious.

Most observers tend to agree with Tredgold in leading us to believe that mongols are, as a rule, as nearly perfect in disposition and general behaviour as could be wished; far more so it would seem than most normal children can attain to, and unquestionably so in comparison with other mental defectives. Occasionally this generally accepted description has been modified, and recently it has been seriously challenged by Rollin. Rollin goes so far as to say that "It is time that the mongol should be debunked and brought back into his true perspective," and that the text-book description as typified in Tredgold is sadly erroneous. It is, incidentally, in this author's article that the present writer has found the only serious attempt at statistical evaluation of the traits in question.

The work presented in the following pages was undertaken with the intention of tracing the development of the commonly accepted views concerning the emotional and behavioural characteristics of mongols, and subjecting these views to closer observation than heretofore. Statistical evaluation has been attempted where practicable. The observations were made upon the inmates of Stoke Park Colony, Bristol.

A Brief Survey of the Views of Previous Writers.

Although the antiquity of the idiot is presumably as venerable as that of Man himself, the earliest genuinely scientific interest shown in mental deficiency would appear to be the classical experiment of Itard, at the commencement of the nineteenth century, in which he attempted to reclaim to human society the wild and nameless boy known as "The Aveyron Savage." Itard made some progress in the education of this lad, but eventually abandoned the project in bitter disillusionment, adverse personality changes occurring at puberty having spoiled Itard's initial success in taming him to an affectionate,

clean and docile boy. The seed, however, had been sown, and further attempts accompanied by much toil and patience soon reaped an encouraging measure of success in dealing with that section of the community previously regarded either superstitiously with reverence, or with contempt.

Before the middle of the century Séguin, more impressed by Itard's success than Itard himself, founded a private school for idiots in Paris. His enterprise quickly gained for him the enthusiastic approval of the public, the directorship in 1842 of a national institution for defectives at Bicêtre, and a special commendation from the Pope. It is in this author's work that the first account is given of those gracious attributes of idiots in general which were later to be held by many as characteristic of mongolism in particular.

To Séguin all idiots were alike in their responsiveness to music and to human eloquence. They were one and all unusually affectionate and considerate to others. There was indeed no fault to find in them ; no shortcomings as in other children. Their gestures and grimaces were interpreted by him as indicating minds more aesthetically and intuitively advanced than in the normal subject ; the only defect being an inability to demonstrate this to the conviction of others. Irritability, aggressiveness, impulsive violence, and all unclean and undesirable habits were not theirs by nature, and when displayed at all must first have been taught them by others or occasioned by some cruel treatment imposed upon them.

Such was Séguin's opinion. Others may hold very different views ; but it should be borne in mind that Séguin, a pioneer worker amongst defectives and a devoutly religious man, had every reason to be highly incensed at the injustices heaped upon these unfortunates in his age, and probably allowed his human sympathy to influence unduly his scientific judgment. He did, nevertheless, frequently observe many faulty habits and bad behaviour traits amongst his subjects. Mongols were, from his description, almost certainly of the type designated by him "furfuraceous cretins," and it is to be observed that no special graces were claimed for them more than others. Séguin's rather exaggerated views barely outlived him and, but for the exception of the mongol, the glory of the idiot is long since departed.

An important point should be made clear at this stage. In medical works of this period the term "idiot" was used to include all grades of defectives without reference to the actual level of intelligence. An "imbecile" denoted one who, once normal, had become demented by senility or some pathological process.

Langdon Down in his ethnic classification of idiots described minutely the physical characteristics of mongolism, and observed that all its subjects presented a close resemblance to one another in mental power. "They have considerable power of imitation," he said, "even bordering on being mimics. They are humorous, and a lively sense of the ridiculous often colours their mimicry." He mentioned that several of his subjects used to convert pillow slips into surplices and to imitate, in tone and gesture, clergymen. One boy spontaneously mounted a platform and grotesquely imitated a ventriloquist. Their sense of the ridiculous was evidenced by the humorous remarks and laughter with which they hailed the accidental falls of their companions.

They were always amiable both to their companions and to animals, he stated, but they were neither passionate nor strongly affectionate.

This writer observed a very marked obstinacy amongst mongols, and stressed the necessity for consummate tact in their guidance. He frequently noticed them rehearsing to themselves scenes which they apparently expected to take place the following day. These phantasies invariably involved the defiance of authority, and he concluded that discretion would often be found the better part of valour by not giving orders which would run counter to the intended disobedience.

Langdon Down leaves us with an impression of the mongol as an easily amused and very amiable person so long as he can have his own way and meet with no correction, delighting in defiance, and showing great aptitude in mimicry. He implies that this mental attitude is as constant and characteristic as the physical stigmata which mark the condition. It is important to observe that the response to music and rhythm, so frequently stated to be a mongol characteristic by later writers, is not mentioned in his description. This trait was in fact particularly observed by him to belong to those cases showing absence of any physical signs associated with feeble-mindedness, and consequently unable to be included in any of the ethnic types. This definitely excludes mongols. Musical response was found mainly in those whose defect was due to post-natal causes, such as trauma or inflammatory disease. These subjects, living, as he said, in a world of their own, are regardless of the ordinary circumstances around them, and yield only to the counter-fascination of music.

Fraser and Mitchell (1876) described fifty-four cases of mongolism which they designated "Kalmuc idiocy." Information regarding the emotional and behavioural aspects of the condition was confined to the description of one case, a woman of forty years of age, who was subject to noisy fits of anger, inordinate love of self-display, and was affectionately disposed towards those who petted her and showed antipathy to all others. She was said to have been fond of music, completely lacking in modesty, possessing filthy habits and a particular aversion to soap and water. A general observation was made later in their paper that the mental state of this class of idiot is as distinct, peculiar, and as steady as the physical; the subjects resembling one another in character, capacity, likings and dislikings, in habits, defects and aptitudes. Nothing was said concerning mimicry.

Fraser and Mitchell's article gives the first reference the present writer has found to the appreciation of music which is so frequently stated to be characteristic of mongols.

Fletcher Beach (1882) in his description of the types of imbecility merely remarked of one of his two mongols that she was cheerful but very restless and destructive. No general observation on mental disposition was made.

At the commencement of the present century Shuttleworth (1900) observed that the mental condition of the mongol type is as equally characteristic as the physical. He stated that the power of mimicry is often extraordinary, that they have a great love of music, their idea of time as well as tune being remarkable, so that they are apt at drill and dancing. He further observed that simple imitative arts, such as writing and drawing, are acquired without much

difficulty. It appears somewhat difficult in the absence of more detailed information to reconcile these alleged aptitudes for writing, drawing, drill and dancing, with the marked clumsiness of movement which he also observed as being equally characteristic.

M. W. Barr (1904) introduced an element of variation within the type in his brief mental notes on five illustrative cases of mongolism. Two showed the combination of affectionateness and good-naturedness with obstinacy and disobedience, together with a sense of humour and power of imitation. A third was merely stated to be a "superficially apathetic idiot," and a fourth a "superficially excitable idiot" and restless. The fifth case was a low-grade epileptic imbecile. It should be observed that this last case is rather misleading if intending to typify mongolism on account of the acknowledged rarity of epilepsy in this condition.

Sherlock (1911) observed that "when sufficiently intelligent to be capable of such manifestations mongols often show an imitativeness and an appreciation of rhythm which are rather striking. They are good-tempered as a rule, though infants showing the condition may be subject to storms of passion, willing and submissive to authority. They show an interest in what is going on about them, and sometimes they are lively, talkative and restless." Sherlock noted their immunity from epilepsy, but observed that they would simulate epileptic fits when they had examples to copy.

Lapage (1911) found the mental characteristics of mongol children little different from those of other feeble-minded children except that they were more difficult to teach and more fond of music. He stated that they have good power of mimicry, and would imitate persons and animals very closely. On the whole he found them fairly happy and contented. No further information is given in the second edition of his book (1920) except that he mentions the predilection of a certain mongol boy for tying string round another boy's throat. No definite indication is given as to the motive of this action, whether it was done with the intention of causing harm or merely the expression of a somewhat perverted sense of humour.

Perhaps the most extravagant description of mongol mental characteristics is that given by Brushfield (1924). He observed a group of 177 mongol children up to the age of 14, and made the following statements: "All without exception are supersensitive to musical sounds. However low grade they are, all can hum a tune readily from a gramophone correct in note and time. The high-grade pick up children's songs very easily at school . . .

"They are generally good at drill and exercises, and are always cheerful, lively, restless and very happy, seldom show temper, and are generally favourites. They are very inquisitive . . .

"They are very good mimics, but I have not noticed any imitation of an epileptic fit seen by them in another child . . .

"None have hitherto shown any erotic tendency."

The major part of Brushfield's thesis consists of carefully compiled and comprehensive tables of detailed measurements concerning the physical aspects of mongolism. The mental observations were confined to the statements quoted.

Penrose (1933) is far less sweeping in his statements. He says that "as a rule they are lively, imitative, and often have a love of music which is rather striking. In disposition they are usually, but not invariably, good-tempered and, as Sutherland remarks, the 'smiling face of the mongolian imbecile suggests the possession of a secret source of joy.' Lastly they appear to have an almost complete immunity from true epilepsy."

As would be expected, Brousseau and Brainerd (1928) give full consideration to the mental and emotional aspects of mongolism. Unfortunately, however, their observations on these particular aspects are not treated statistically as the physical and purely intellectual aspects are. Briefly their observations may be summarized as follows:

There is a tendency to restlessness, which may become exaggerated.

The momentary smiles of infancy may be dismissed as facial contortions without emotional content.

Mongols are not given to fits of rage; they are not ill-tempered and rarely destructive. In only one of their 40 cases was there evidence of bad temper and only two such cases could they find from other authors.

Good-naturedness, cheerfulness, affectionateness and docility are the rule; obstinacy may, however, occasionally present itself and require tactful treatment.

Curiosity and mimicry are often found in the imbecile group, but imitation, when shown, is merely unintelligent reproduction of something seen without ability to originate or form fresh combinations as in a normal child. It might, therefore, be termed echopraxia.

The holding of attention by musical sounds is (as with bright lights) purely a response to pleasurable sensation absolutely void of real aesthetic appreciation.

Brousseau and Brainerd conclude that the mental peculiarities of mongols are not so noticeable as are the physical anomalies, but that there are certain points that appear, however, to be common to mongols with few exceptions; they are placidity, affectionate disposition, good humour, and fondness of music and rhythmic movements.

Benda (1947) considers their emotional response and gift of mimicry to be two great assets of mongol children. He says of these children that if they are treated well they are "lovable little creatures full of affection and tenderness." He quotes an anonymous lady visitor to an institution as saying: "As playmates they are always hugging and kissing one another with vague but genuine smiles of affection. They come up and put their arms round the stranger as confidently as a puppy jumping up on a visitor, and, though not understanding a word said to them, good naturedly answer yes to any question, hoping that will please."

Mimicry, he points out, is not so much a character trait of mongolism as a manifestation of the protracted infancy of its subjects. This gift, he points out, is the outstanding characteristic of normal children, between the ages of two and four, without which they would not learn to talk or eat. Presumably in eating, Benda means to imply the use of spoon and fork, etc. Apparently then, though mimicry may be displayed for a longer period in mongols than in

normal children, it is not necessarily more than is usually seen in normal children.

Stubbornness Benda admits to be a very characteristic behaviour pattern of mongols. He puts forward a neurological hypothesis to account for this peculiarity of mongols which would suggest that it is due to "inflexibility of intentions," or sheer inability to react to new impressions on account of their cerebral structure. The nature of their stubbornness according to Benda is much at variance with the premeditated defiance of authority noticed by Langdon Down.

Of music, Benda believes it is the rhythm which appeals to mongols rather than the melody; nothing, he says, suggests that they have very accurate hearing discrimination.

H. R. Rollin (1946) made a study of the personality in mongolism, with special reference to the incidence of catatonic psychosis in this condition. A résumé of his work, with his findings relevant to the present thesis, is given below.

Rollin examined 73 cases with ages ranging from 8 to 48 years. In them he found bad behaviour almost the rule rather than the exception, no less than 27 showing evidence of gross behaviour disorder in case-histories prior to admission to his Institution. These case-histories, he admits, were often most incomplete. After admission he noted the same behaviour traits in the majority of cases, but in some the more rigid régime of institutional life cut down the scope for misbehaviour which they enjoyed at home. In addition he found a further 17 cases, making 44 (60·2 per cent.) in all, guilty of bad behaviour since admission whose records had previously shown no such evidence. Rollin's bad-behaviour cases displayed one or more of the following traits: violence, temper-tantrums, mischievousness, slyness, cunning, spitefulness, obstinacy, stealing, destructiveness, degraded habits, excitability and noisiness.

Eroticism, as manifested by masturbation, self-exposure, and (in one case) homosexual assault, was found in a considerable number of cases (unspecified), especially amongst males. Two definite cases of masturbation and self-exposure were noticed amongst the females. Rollin's cases included 50 males and 23 females.

He believes that the mongol should be debunked and brought back into true perspective; that the mongol, always a defective, is as such heir to the same instinctual affective pattern of reaction to his environment as his non-mongol defective brother.

He found 32 cases (43·8 per cent.) conforming to the text-book type inasmuch as they showed spontaneous interest in their environment, had powers of mimicry, and were jolly and easily amused. Nevertheless 11 of the 44 cases guilty of behaviour disorder were of this type.

Thirty-one cases (42·4 per cent.) were idle, solitary, uninterested in communal pursuits, showing total lack of spontaneity; and far from possessing the smiling face suggestive of inward joy, he found "their facial expression would rather suggest the possession of some rooted source of grief."

Rollin assembled his mongols, seated, to listen to simple dance music, but gave them no initial instructions. By their facial expressions he found that

"some obviously enjoyed the entertainment." None danced spontaneously, and with much coaxing only 24 could be persuaded to join in dancing which, he says, was of a very inferior order. He also states that it can be safely said that in not one case was the tempo of the music maintained or brought out. The majority of his "introverted" type (i.e., the 31 idle, solitary cases) were completely apathetic to the music or the antics of their fellows.

Concerning mimicry, it may be assumed that 32 of Rollin's cases showed this trait, though no more definite information is given. He does, however, make a further remark that "True echopraxia was, however, seen only occasionally and echolalia in only one case."

Rollin's investigations were performed with reference to his thesis that mongols are frequently the subjects of a form of psychosis which occurs in addition to their mental deficiency. Whether or not these subjects are in fact prone to a particular form of psychosis does not affect the validity of his findings in their application to the description of the mongol type. His findings are, it will be readily appreciated, at considerable variance with the observations made by most previous writers. They are, moreover, supported by some degree of measurement.

This section may be concluded with the observations of Engler (1949) taken from his monograph on Mongolism, in the bibliography of which Rollin's work does not appear.

He states that every kind of erotic perversion is as good as unknown in mongolism.

Concerning the response to music, he observes that excluding idiots there are few exceptional cases who do not appreciate any kind of music and join in singing often quite correctly. He noted the surprising ease which many mongols possess in catching and reproducing a tune correctly. Amongst females he had seen several exceptionally good dancers.

In mimicry he found mongols strongly reminiscent of monkeys.

After emphasizing the dullness and almost complete apathy of lower grades, he says that mongols with higher intelligence also fail to show that measure of interest and attention expected of normal or of other feeble-minded children.

Temperamentally he distinguishes three well-defined groups of mongols. The first, and by far the largest, comprises those who conform to the usual text-book description with all the positive traits of a lovable disposition.

The second group consists of a minority of idiots who remain dull and listless through life, and do not respond to their surroundings, music, or dancing.

To the third group belong those who show exactly the opposite attributes of the first group and manifest all the generally listed behaviour disorders. The size of this group must presumably be something between those of the first two.

Evidence Obtained from Case-histories Prior to Admission to Stoke Park Colony.

The first of the investigations undertaken at Stoke Park was to obtain information regarding the temperamental peculiarities of mongols as they had appeared to those who had observed them before admission to the Colony.

This information was obtained from admission forms giving spontaneous statements made by medical practitioners, relations, guardians, and others having personal knowledge of the cases for the purposes of certification. Relevant statements were recorded together with answers to certain specific questions where such questions had been printed on the forms. In some cases letters from relatives and others to members of the Staff of the Colony yielded useful information. Only positive information of a definite nature was recorded, all doubtful or ambiguous statements and inferences being ignored.

In this way relevant information concerning 140 mongols was obtained, and for purposes of comparison similar information concerning 100 controls was collected. The 140 mongols represent the total number available in the records of the Colony about whom positive information of relevant nature had been given. The 100 controls were obtained by taking cases to that number alphabetically from a list of subjects considered comparable with the mongols by the rigid criteria described below, and, as with the mongols, about whom positive information was available.

All the mongol subjects used for this investigation showed subnormal intelligence with a Binet I.Q. of less than 46, and presented, as in Rollin's cases, no less than four of the characteristic physical stigmata. No doubtful cases were included. None were blind, hemiplegic, or showed any clinical evidence of gross brain injury, or had a history of encephalitis or other cerebral inflammatory disease. Only two cases with a history of epilepsy were found in the records of the Colony, and these were excluded on account of its rarity amongst mongols. Engler challenges the generally held opinion concerning the rarity of epilepsy in mongolism, but even the acceptance of his views would still show the co-existence of these two conditions to be very uncommon. It is interesting to note that one of the two epileptic mongols was alleged to have exhibited outbursts of excessive violence and sadistic cruelty, and was addicted to depraved sexual behaviour.

In selecting the controls subjects were chosen to compare as nearly as possible, intellectually and physically, with the mongols.

All the subjects with a Binet I.Q. of 46 and over were rejected. Blind subjects, epileptics, hemiplegics and others showing clinical evidence of gross brain lesions, together with all those with a history of cerebral inflammatory disease, were also rejected. By this method of selection it was felt that the mongols would be compared with non-mongol defectives of about equal intelligence, not handicapped by physical conditions which might have prevented them from displaying their full personalities and aptitudes to the same extent as the mongols.

The information thus obtained has been tabulated ; the numbers and percentages of mongols and non-mongols alleged to have displayed the various traits listed are shown in the table. The significance or otherwise of differences observed between mongols and non-mongols has been checked by means of the χ^2 formula and marked in the table where positive. Throughout this investigation significance is estimated at the 5 per cent. level.

The fifteen traits listed represent all those relevant to temperamental disposition and imitative ability which were actually named in the admission

forms and letters as they appear in the table or were definitely indicated by terms used in these documents.

Table Showing Number and Percentages of Mongols and Controls about whom Positive Information regarding Certain Traits was given on Admission Forms.

Trait.	Total number 140. Mongols.		Total number 100. Controls.	Significance.
	Number.	%.	Number and %.	
Affectionate	17	12·1	14	..
Cheerful, etc.	28	20	20	..
Friendly, sociable	20	14·3	15	..
Docile, etc.	24	17·1	31	+
Imitative	10	7·1	8	..
Solitary	22	15·7	5	+
Irritable	37	26·4	21	..
Violent	19	13·6	14	..
Destructive	34	24·3	24	..
Mischievous	53	37·9	24	+
Restless	57	40·7	44	..
Noisy	44	31·4	34	..
Sadistic	7	5·0	3	..
Truant	11	7·9	8	..
Fond of music	11	7·9	7	..

Although the significance of the terms used in the foregoing table is quite clear, certain additional information may be helpful.

By imitation is implied the repetition in action and gesture of some performance witnessed, such as the examining of a patient by a doctor or the antics of a dog. Simpler imitation as used in learning to walk or feed with a spoon is, as Engler points out, necessarily displayed by all children who learn to achieve these actions.

By violence is implied the actions evoked by provocation or resulting from bad temper; it is recorded separately from sadistic tendencies in which the subjects without provocation indulge in cruelty to other individuals or to animals with apparent enjoyment in so doing.

Significant differences between mongols and non-mongols are exhibited in connection with three traits only. Mongols are shown to be less docile, more solitary, and more mischievous than non-mongols. It will also be noticed that non-significant differences, where they exist, do not tend to favour the mongol.

It should be appreciated that in both groups the evidence available was in many cases incomplete. No standard questionnaire had been issued, and in cases in which no specific questions relating to the traits concerned appeared on the admission forms evidence was limited to statements volunteered spontaneously. The findings obtained from such an investigation cannot therefore be considered sufficiently complete to base any trustworthy description of the mongol temperament upon them, but the fact that the same limitations apply equally to both groups allows a fair comparison to be made between them. There is at least one advantage in the method, in that none of the persons supplying information could have known that their evidence would be used for this purpose. Few of them would know what a mongol is supposed to be like, and in very many instances the certifying practitioner did not signify in mongol cases that he even recognized the condition.

It is perhaps somewhat surprising in how few cases such frequently asserted mongol characteristics as imitation, love of music and affectionateness were mentioned, though it must be appreciated that the information given was primarily intended to facilitate the admission of the subject to an institution, and unpleasant rather than pleasant traits would therefore quite likely be emphasized. Nevertheless obstinacy was not once mentioned explicitly in either mongols or controls, though fairly well known as an alleged mongol failing.

With regard to sexual behaviour, an item not appearing in the above table, the following information was obtained. Of the mongols one male imbecile of 17 years was sexually precocious with girls; two male imbeciles aged 10 and 16 respectively and a female idiot of 6 were addicted to masturbation. Of the non-mongols, two male imbeciles aged 8 and 11 and one female imbecile aged 11 were given to masturbation, and two female imbeciles aged 9 and 13 were sexually precocious with boys.

Evidence Obtained from Observation of Cases in Stoke Park Colony.

In view of the incompleteness of the information obtained from case-histories as shown in the previous section, a more thorough investigation of mongol temperament was attempted by means of a questionnaire issued to certain members of the nursing staff of the colony. Information obtained in this way was given by nurses permanently in charge of the various houses who had been in a position to observe the patients continuously for periods varying from four to twelve years. Absolutely no indication of the purpose of the investigation was given to them.

Lists of names of all the patients in the various houses were prepared alphabetically, mongols being thus mixed up with all the other types. Twelve columns, each headed by a trait named and described exactly as appearing in the table below, appeared alongside the names of the patients. The nurses were requested to signify in each column, by a + against the names of the patients, those showing to a conspicuous degree the traits named at the heads of the columns.

The lists being returned, the same method of selection was adopted as in the previous investigation. All cases, actually very few in number, quite incapable of showing any response whatsoever—the completely helpless, speechless, immobile type, void of any obvious spark of personality—were excluded. Such cases, considering that positive information of a relevant nature had been given, were obviously not amongst those selected for the investigation described in the previous section.

No mongol had a Binet I.Q. of more than 45, consequently all cases over this level of intelligence were rejected. Subjects selected fulfilled the same criteria as before.

In this way particulars relating to 60 mongols were obtained. A large number of comparable non-mongols were available, and the particulars of 300 of them were taken, as a convenient number with which to work percentages, alphabetically from the lists.

The larger number of mongols in the case-history investigation is accounted

for by the fact that more than half of them were dead subjects whose particulars had been taken from the records.

The tabulated findings are given below:

Table Showing Results of a Questionnaire Relating to Certain Character Traits in 60 Mongols and 300 Non-Mongols.

Trait.	Mongols.		Non-mongols.		Significance.
	Number.	%.	Number.	%.	
Affectionate, loving	12	20	54	18	*Nil*
Cheerful, good-tempered	15	25	84	28	,,
Sociable, likes mixing with others	12	20	71	23·6	,,
Docile, easy to discipline	19	31·6	99	33	,,
Mimics other people or animals	6	10	21	7	,,
Solitary, will not mix	10	16·6	45	15	,,
Irritable, easily annoyed	17	28·3	88	29·3	,,
Subject to outbursts of physical violence	6	10	39	13	,,
Wilfully destructive with toys, clothing, etc.	17	28·3	84	28	,,
Generally mischievous	24	40	108	36	,,
Restless	26	43·3	120	40	,,
Noisy	13	21·7	75	25	,,

In this table it will be seen that three traits listed in the previous table do not appear. In the case of musical response a separate section has been devoted to this subject for reasons given in that section. Truancy and sadistic tendencies have been omitted as figures concerning them were considered to be of little value in the table; general observations on these traits are given later in the present section.

It will be noticed that no significant differences are shown between mongols and non-mongols in this table.

No individual in either group showed all the favourable traits, neither did any display all the unfavourable ones. Good and bad points were fairly well distributed in both groups. A reasonably clear demonstration of the distribution of behaviour tendencies is given by showing the individual and collective scoring on a ten good-points system. In this each individual may be said to score a good point if he does not show a bad one. Subjects showing positive good temper and sociable habits in the foregoing table are included with all

Table Showing Individual Scoring on a Ten Good-Points System.

Trait.	Mongols. Total number 60.		Non-mongols. Total number 300.	
	Number.	%.	Number.	%.
Affectionate	12	20	54	18
Not irritable	43	71·6	212	70·6
Not solitary	50	83·3	255	85
Docile	19	31·6	99	33
Not violent	54	90	261	87
Not destructive	43	71·6	216	72
Not mischievous	36	60	192	64
Not restless	34	56·6	180	60
Not noisy	47	78·3	225	75
Mimicking	6	10	21	7

Table Showing Distribution of Scores on the Ten Good-Points System.

Number of cases.	Mongols.		Non-mongols.	
	Number.	%.	Number.	%.
Scoring less than 5 points .	0		0	
,, 5 points . . .	20	33·3	105	35
,, 6 points . . .	36	60	175	58·3
,, 7 points . . .	4	6·6	20	6·6
,, more than 7 points .	0		0	
Total numbers . .	60		300	

others not showing the opposite tendencies to irritability and solitariness respectively.

This analysis clearly suggests that there are no significant differences in emotional disposition and behaviour between the mongols and non-mongols; that individuals tend to centre round the average in these respects, there being no wholly good or wholly bad cases in either group. There are no indications for subdividing either group into emotional reaction types.

Three further points of interest should be mentioned here. Concerning manifestations of the sexual impulse, insufficient detailed information could be gathered to be of much statistical value. It would appear, however, from general observations that masturbation is observed amongst mongols, both male and female, but not frequently; not so frequently in fact as amongst other defectives of the idiot and imbecile grades. No homosexual assaults or instances of precocity with the opposite sex have been noticed amongst mongols by the staff of this Colony.

Truancy was a tendency sometimes noted in the case-history investigation. There would appear to be a general tendency amongst all ambulant defectives to wander aimlessly about, but no instances of definite absconding have been observed amongst mongols or other defectives of their intellectual level in this Colony.

The question of violence was further discussed in relation to all the subjects marked as showing this tendency in the original lists distributed to the staff. In no case could this tendency occurring in mongols or comparable non-mongols be described as truly sadistic in nature.

Response to Music and Rhythm.

With reference to this aspect of the subject little information has so far been given.

In the case-histories it was observed that 7·9 per cent. of the mongols and 7 per cent. of the non-mongols were alleged to have exhibited a certain fondness of music prior to admission to Stoke Park Colony. In what manner this "fondness" was manifested is not explained except that in three instances—one of the eleven mongols and two of the seven non-mongols—the subjects were said frequently to amuse themselves by singing and dancing.

As no definite information could be obtained concerning the individual response to music found amongst idiots and imbeciles from general observation on the wards, it was decided to make a detailed examination of this question under test conditions. The most that could be obtained by questioning the

staff was a few general remarks, of which the following is typical. To the question, "Do you find that music has any effect upon these children?" the reply was "Oh yes, I think it quietens them a little, or else we do not notice their noise quite so much when the wireless is on." It was also generally observed that infants, whatever their type of mental defect, tended to be soothed by music on the wireless.

The Seashore and other standard tests of musical ability being quite unsuitable for application to subjects of such low mentality as those it was proposed to investigate, a more simple scheme was devised and carried out with the assistance of an expert of the Margaret Morris School of Movement.

Forty-two mongols, representing the total number at the time available who were well and able to take part in the proceedings, were tested. The same number of comparable non-mongols, selected according to the same criteria as previously and taken alphabetically up to the required number, were given the identical tests under exactly similar conditions. The tests and findings are described below.

A. *General Response to Music.*

The subjects, in white shorts and blouses, were seated in a row, cross-legged, upon the floor. Their facial expressions, gestures and movements were closely observed during an initial period of silence and whilst music was played on a piano. No instructions were given. Music of two kinds was played, a quick strong rhythm (Hugh Bradford No. 3) was first presented, followed by a soft flowing rhythm (Handel's Minuet from 'Berenice.')

Six mongols and six non-mongols, representing 14·3 per cent. in each group, showed obvious enjoyment of the music in their facial expression and sustained attention until the music ceased. No preference was indicated for one type of music rather than the other.

No spontaneous rhythmic movement or other bodily response was observed in any case. Of those showing no appreciation the majority sat motionless and apathetic whilst a few played about incessantly in an aimless way.

B. *Rhythm.*

The subjects were seated in a circle on the floor. A small drum was beaten with a drumstick before each subject in turn, who was then handed the instrument and instructed to copy the performance just witnessed. Three different rhythms were used. Each subject was allowed three attempts at each rhythm, the instructor repeating the performance between each attempt. The whole circle completed the test in one rhythm before proceeding to the next.

The findings are tabulated below:

	Mongols.		Non-mongols.	
	Number.	%.	Number.	%.
Perfect performance	14	33·3	8	19
Good attempt	4	9·5	6	14·3
Total showing good sense of rhythm	18	42·8	14	33·3
No sense of rhythm at all	24	57·2	28	66·7
	42	100	42	100

No difference in performance was shown in connection with the different rhythms; those who did well did so in all three whilst the others were consistently bad.

Although superficially the figures in the above table might suggest that the mongols have a better sense of rhythm than the non-mongols, application of the χ^2 formula shows that the difference which exists is not significant.

c. *Timing.*

Four types of exercise were carried out to musical accompaniment, instruction being given:

1. Marching in line.
2. Breathing exercises with stretching and relaxing.
3. Head turning and nodding.
4. Body bending.

It was only possible to assess those who kept good time and those who could not do so at all. The difference was quite obvious, and no more detailed scale of marking seemed necessary or practicable.

Those who scored well did so in all four exercises; bad scorers were consistently bad.

The table below shows the findings:

	Mongols.		Non-mongols.	
	Number.	%.	Number.	%.
Good time-keepers . .	18	42·8	14	33·3

It is noteworthy that the subjects who showed good timing in these exercises were precisely the same ones who scored well in rhythm. The same difference between mongols and non-mongols is obvious.

Only 4 of the 6 mongols and all the 6 non-mongols who showed pleasurable general reaction to music were included in those who were good at rhythm and timing.

d. *Tune.*

Attempts were made to encourage the groups to join in singing or humming nursery rhymes and popular songs without any satisfactory result. Both mongols and non-mongols made plenty of noise without any resemblance to the tune. Not one subject tried singing individually.

Incidentally I have not heard of any subject of idiot or imbecile grade, mongol or otherwise, in this colony who has been known to try to reproduce a tune on the piano, though many have enjoyed banging loudly on the keys at random. I have, however, heard a few imbeciles, but only one mongol, singing nursery rhymes with recognizable tune.

Summary and Conclusions.

A description of the mental disposition and behavioural characteristics found in mongolism, as it appears in the current edition of Tredgold's *Mental Deficiency*, has been given. This description tends to present mongolism as a

type of mental deficiency more richly endowed with attractive characteristics and less conspicuous in undesirable tendencies than other types is observed.

Séguin's highly charitable, though unquestionably exaggerated, views concerning the mental disposition of idiots in general, though pertaining to no type in particular, have been noted, together with the fact that the undesirable tendencies supposed by him to be alien by nature to the idiot personality were notwithstanding only too obvious amongst his own subjects.

The original account of the mental characteristics of mongols as a distinct type of defective, given by Langdon Down nearly a century ago, has been described. Starting with this account the observations of a number of authors to the present day have been reviewed in chronological order. With regard to certain aspects of the mongol temperament and aptitudes, agreement was found to be so close between many writers as to lead to a rather monotonous repetition of the same words and phrases in their several descriptions. Divergent views were, however, not infrequent, and contrary opinions to those generally held were sometimes given. Inconsistencies were occasionally detected in the observations of a single author. In some instances the whole question seems to have been dealt with in a few dogmatic generalizations.

From this brief survey of the literature the following observations may be made :

That until recently many authorities, in spite of certain differences of opinion which they held concerning the actual constitution of the mongol personality, were very definite in affirming that the mental characteristics they described were as constant as the physical characteristics of the condition. Some authorities, however, more guarded in their statements, acknowledged that exceptions to the rule were not infrequent.

In general the idea that mongols do more or less conform to a somewhat happily disposed attractive type of personality with various pleasantly interesting aptitudes has persisted to the present day, as witnessed by the account in Tredgold's textbook. Less insistence is made upon the rigidity of the mental disposition throughout the type than in former times ; more exceptions are generally allowed, and Engler is of the opinion that there may be three fairly distinct temperamental types amongst mongols.

Rollin has recently suggested, very strongly, that the textbook description of the mongol as it appears in Tredgold is sadly erroneous and that the mongol has not as a general rule the pleasant, happy, attractive personality he is supposed to have, and is in fact just as subject to undesirable tendencies as his non-mongol defective brother.

Rollin was the only writer consulted who was found to have based his observations on statistical inquiry.

An attempt has been made at Stoke Park Colony to examine the question of mongol temperament and musical aptitudes more closely in order to ascertain whether mongols do in fact conform to the usual text-book description, and to compare mongols in this respect with comparable non-mongol defectives.

Information concerning relevant aspects of behaviour prior to admission to the Colony in the form of positive statements appearing on admission forms, etc., was collected in respect of 140 mongols. This information was tabulated

showing the number and percentage of cases exhibiting the traits listed in the table. The findings were compared with those relating to 100 non-mongol controls. The limitations of this method of investigation were discussed, and the inability to base a valid account of the mongol personality upon the findings was observed. The comparison was, however, thought to be fair inasmuch as the limitations applied equally to both groups.

Statistical examination of the findings showed only three significant differences between the two groups, mongols appearing significantly less docile, more mischievous, and more solitary than non-mongols. Other differences, where they were shown at all, though not significant, were still not generally in favour of the mongol. Significance has been estimated at a 5 per cent. level.

Instances of precocious sexual behaviour were observed in both groups.

The only inferences which may legitimately be drawn from this investigation are that mongols would seem to display the same undesirable habits and tendencies as non-mongol defectives, and at least as frequently. They may possibly be even less docile, more miscieivous and more solitary as a group.

A questionnaire in respect of all patients in the Colony was issued to certain members of the nursing staff who were asked to indicate the patients who showed to a conspicuous degree certain named tendencies. These tendencies included the pleasant ones generally supposed to be characteristic of mongols in particular and the usual undesirable ones so frequently found amongst defectives. No indication of the purpose of the questionnaire was given. Particulars relating to 60 mongols and 300 comparable non-mongols were collected and compared.

The findings showed absolutely no significant differences between mongols and non-mongols in any of the tendencies investigated.

It was also shown that there were no remarkably good or remarkably bad cases in either group which could have influenced the statistical findings. Good and bad tendencies were fairly evenly distributed amongst the individuals in each group singly, and the distribution pattern in both groups was almost identical.

There were no indications that mongols conform generally to any one or more well-defined emotional or temperamental types, nor that they differ noticeably in temperament, in respect of any tendency investigated, from comparable non-mongol defectives.

General observation proving quite inadequate concerning the question of response to music, a series of simple tests was carried out upon groups of equal numbers, 42 subjects in each group, of mongols and comparable non-mongols. The tests were designed to investigate general response to music, sense of rhythm, timing, and the sense of tune. No significant differences were observed between mongols and controls.

It would appear, from the whole of this investigation, that mongols do not generally conform to any characteristic temperamental type or types, and that no significant differences may be observed between them and comparable non-mongols with regard to the character-traits investigated or their response to music and rhythm.

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A COMPARISON OF TERMAN MERRILL SCALE TEST RESPONSES AMONG LARGE SAMPLES OF NORMAL, MALADJUSTED AND BACKWARD CHILDREN.*

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Introduction.

There is a considerable body of literature concerning the diagnostic value of differences in pattern and scatter found in response to intelligence tests.

Irregularity of performance as a distinguishing characteristic of M.D. children was noted early in the history of mental tests (Binet and Simon, 1916), and the significance of pattern and scatter has continued to be of recurrent interest with reference to other groups of abnormal subjects.

With varying emphasis, the attention of investigators over the past 30 years has been directed mainly to two aspects of the problem :

(*a*) the extent of sub-test scatter,
(*b*) differences in pattern of response.

Although these two aspects cannot be entirely divorced from each other in any consideration of pattern abnormality, the former may be treated purely as a quantitative matter, while the latter is essentially a question of qualitative differences. In judging abnormality of pattern, it is of importance to know in what type of test any unusually early failure has occurred, and in what type of test isolated passes have continued at age levels beyond those at which all else has been failed.

Between 1920 and 1940 about 30 investigations into the responses of normal and abnormal subjects to various versions of the Binet mental tests were published. In the last decade a further 20 studies at least, based on similar inquiries into other scales, have been reported. Remarkably few of the earlier inquiries, using the Binet scales, dealt solely with children's records, while later inquiries, almost without exception, have referred to adult populations.

Methods of assessing characteristic differences have varied according to the type of test used, but much of the earlier work was concerned with the significance of quantitative scatter.

Despite a multiplicity of inquiries, however, the results were conflicting, with inconclusive and even apparently contradictory evidence. Though May-

* Abstracted from a thesis approved for the degree of Ph.D. (University of London, 1952).

man (1946), reviewing the evidence, concluded that scatter analysis had been shown to have diagnostic value, a criticism commonly made was that the value, if any, was limited, since quantitative methods failed to stress the specific nature of the failures (Harris and Shakow, 1938 ; Lorr and Meister, 1941 *et al.*). There had been, however, some general agreement regarding qualitative differences and, of the inquiries made before 1940, some 20 had been directed to those qualitative differences which appeared to characterize different nosological groups. Several workers were in agreement that test failure among psychotic and maladjusted subjects occurred whenever sustained effort and attention were required, or when tests necessitated the facing of social realities. Among reasons advanced for disparities in the many conclusions was that which attributed discrepancies to the fact that few investigations had been undertaken into the records of sufficiently large and really comparable groups of subjects, and that certain variables, such as chronological and mental age, schooling, background and degree of co-operation of the subjects, had not been controlled. Other writers drew attention to the need for methods of assessing differences which would be based on the predictive capacity of the combined sub-tests in a battery, and which, at the same time, would differentiate the nature of failures. Klein (1948) remarked on the fact that the literature was " . . . notably deficient in statistical evaluations of a clinical test battery as a whole . . . " At least three reports,* however, have been published in which methods were employed which attempted to allow for the effects of quantitative scatter and, at the same time, to give due weight to differences in the response profiles. Myers and Gifford's analysis of the performances of psychotic and normal subjects is, however, the only one based on the Terman-Merrill (1937) Revision, Form L, of the Stanford Binet Scale. Their inquiry was intended to show—

> (1) the extent to which schizophrenic subjects differed from normal subjects, of the same level of ability, with respect to the relative difficulty of test items within each year level ; and
>
> (2) whether these differences could be used to re-score individual test records for abnormality of pattern.

They found that, within each test year, schizophrenic subjects consistently displayed a distinctive pattern of successes and failures which was quite different from that of normal subjects. Their scoring system was based upon the difference between the respective proportions of normal and abnormal groups passing each item within each test year.

A key was derived from these differences ; a plus sign indicated that a greater proportion of passes was found among subjects in the abnormal than among those in the normal group ; a minus sign showed the reverse to be the case.

In test year XII, for example, more abnormal than normal subjects passed item 1 (vocabulary), item 4 (reversed digits), and item 5 (abstract words) ; a greater proportion of the normal than of the abnormal group, however, passed

* Piotrowski, 1937 ; Malamud and Palmer, 1938 ; Myers and Gifford, 1943.

item 2 (verbal absurdities), item 3 (picture 2) and item 6 (Minkus completion). The abnormal pattern key for year XII was therefore as follows :

Item.	Key.
1	+
2	−
3	−
4	+
5	+
6	−

To each item was then assigned a numerical value, based on the extent of the difference between the respective percentage of subjects in each of the two groups who passed each item. Where, for instance, in year XII there was a large difference between proportions of normal and abnormal subjects passing item 1, a weight of 31 was given this test ; where, at item 5, the difference was considerably smaller, a weight of 16 was given ; the much smaller difference at item 6 was allotted a weight of 3.

The numerical values were such that the plus and minus weightings balanced, each adding up to 50 in each test year. The numerical values and key signs are given below as an illustration :

Item.	Key.	Weight.
1	+	31
2	−	20
3	−	27
4	+	3
5	+	16
6	−	3

In re-scoring an individual record for abnormal pattern, where there was agreement between the key and the subject's record, a plus sign was assigned to the appropriate numerical value for that item. Where the key and the individual record differed, a minus value was given to the weighting. The score for any test year was the algebraic sum of the plus and minus values, the maximum possible score for any test year being ± 100. Thus a subject who, in year XII, passed items 1 and 2, but failed the remainder, obtained a score for that year as follows : + 31, − 20, + 27, − 3, − 16, + 3 = + 22. The final score was then obtained by summing algebraically the scores obtained for each test year and dividing this sum by the number of years in the range between the basal and total failure years, so that individual subjects' final scores would be comparable irrespective of the amount of scatter. In the present study these final scores are referred to as "deviation scores." As a further attempt at refinement Myers and Gifford later applied an age adjustment ; but, for reasons given below, this was not used in the present inquiry. Myers and Gifford based their study on a total of 961 subjects, of whom 498 were abnormal and 463 were normal.

Their inquiry was of particular interest for the following reasons :

1. It made use of the test battery as a whole.

2. It coped with the problem of lack of continuity in functions tested, which had given difficulty in earlier investigations in which versions of the Binet scale had been used.

3. It stressed the qualitative differences in the response patterns of individuals.

4. It provided a quantitative method of scoring qualitative differences, allowing also for the effects of scatter.

5. It appeared to be the only published record of an attempt at devising a method of scoring for use with the latest and now most widely used revision of the Binet scale.

It is surprising, therefore, that no more recent published study of patterning appears to have employed this method. A search of the literature showed neither follow-up nor extended application of the results of Myers' and Gifford's work.

Present Study.

1. *Inquiry.*

The following inquiry was undertaken to see whether Myers and Gifford's system would have any diagnostic value when applied to the records of subjects within the age range 7–14 years whose behaviour was symptomatic of social maladjustment or personality disorder. Information was sought on the following questions:

(*a*) Do groups of children with specific types of difficulty show characteristic differences in the size of their scores?

(*b*) Among children, are deviation scores as influenced by chronological age as Myers and Gifford's records suggested?

(*c*) Is there any significant association between the deviation scores and either mental age or I.Q.?

(*d*) Are scores with a "minus" value found to be generally associated with records of subjects presenting problems of a distinctly different type from those whose scores have "plus" values?

(*e*) Is any sex difference to be found among children's scores?

(*f*) Do different item profiles, made by the patterns of successive plus and minus weights, occur in the records of subjects who present different types of problem?

(*g*) Are significant differences in extent of test scatter associated with different types of problem?

(*h*) Does Myers and Gifford's system, when applied to test records of large samples of subjects aged 7–14 years, differentiate either groups, or individuals, presenting specific difficulties?

2. *Subjects.*

Among Myers and Gifford's normal subjects whose records were used to compute an age adjustment for the final score there were 162 children, of whom 50 were aged from 5 to 9 years and 112 aged between 10 and 14 years. In the study now reported, the records of 1,955 subjects aged 7–14 years were analysed and re-scored according to Myers and Gifford's system. Of these records, 1,297 had been collected, over a period of about three years, from subjects seen during the ordinary course of work at child guidance clinics, a

children's hospital, a juvenile court and in schools. Apart from the fact, therefore, that they all, at the time of examination, had presented problems of one or another sort, they were not otherwise specially selected for the present inquiry, since all cases seen during a certain period were included. The remaining 658 were, however, selected particularly ; some were chosen for their very good social and educational adjustment, some as showing difficulties common among high grade mentally subnormal patients in an institution, and others, drawn from a variety of sources, were deliberately selected in such a way as to form a randomized sample of school age population with an I.Q. distribution fitting as closely as possible to the normal curve. The actual numbers of subjects from each of these sources were as follows :

562 referred to clinics and hospitals for behaviour and personality difficulties and for psychosomatic symptoms.

502 charged at a juvenile court, or summoned before a court as " in need of care and protection."

233 referred by teachers and others for general or specific learning difficulties, or on account of associated problems.

108 patients in an institution for mental defectives. Since only one of this number had an I.Q. below 55, that of the majority falling between 55 and 85, with 8 scattering above this level as far as I.Q. 99, this group tended to present behaviour problems which, in some respects, were different from those commonly associated with mentally lower grade patients.

100 children considered by their teachers to be particularly well adjusted, though not necessarily the most intelligent, and, as far as could be ascertained, to have presented no problem either in or out of school.

450 children, from a variety of sources, forming a randomized sample control group with a normal I.Q. distribution. This group included—

(*a*) children seen originally, not as presenting any intellectual or behaviour problem, but for such purposes as vocational guidance, or because they had been chosen as normal control subjects in another inquiry, or simply because they happened to sit next to a child who had been a subject in some other investigation :

(*b*) The sibs of children selected for a previous inquiry into birth weight differences ;

(*c*) the sibs of a group of spastic children ;

(*d*) a group of children from primary, secondary, grammar and special schools, some of whom were chosen because they were sibs of children who had obtained free places at grammar schools, and some because they were the sibs of children ascertained as educationally retarded or mentally backward ;

(*e*) children who were sibs of ascertained defectives ;

(*f*) children who were cousins of defectives.

Among the subjects available in groups (*a*) to (*d*) above there were found to be too few within the I.Q. range 85–120. In order, therefore, to supplement these so as to obtain the required proportional incidence in each I.Q. range without decreasing the control group numbers, the subjects in (*e*) and (*f*) were

added. The mean I.Q. for the resulting control group of 450 subjects was then 102·78, with a standard deviation of 16·86, which seemed to compare favourably with the mean of approximately 103 and a standard deviation of approximately 17 given in the standardization data of the test used.

For the records of subjects in (*e*), (*f*) and a few of those in (*a*) I am indebted to Dr. M. A. Mellone and Mrs. E. H. Scarr, of the Royal Eastern Counties Institution Research Department, whose help in building up the required control group was much appreciated.

3. *Method.*

Myers and Gifford's method of scoring was applied to the Terman Merrill (1937) Revision Form L (full scale) records of all the above subjects. The age adjustment suggested for subjects aged 14 years and under was not used, since it was based on such small samples that it was deemed advisable to see whether data from larger samples would confirm the suggestion that age adjustments were needed and whether, if this were so, a more finely graded scale than that given by the authors of the system could be constructed. The 1,405 subjects who presented special difficulties were grouped into the following classes:

Clinical Groups.

(1) Stealing, larceny, breaking and entering, etc.

(2) Aggressive behaviour, absconding, truancy, wandering, lying, etc.

(3) Psychosomatic disorders, hysteria, fears and phobias, solitariness, apathy, poor concentration, etc.

(4) General and specific learning problems, poor work record, general social inefficiency.

4. *Results.*

(1) *General Distribution of Scores.*

Deviation scores from all sources were symmetrically distributed. Except for that between the control and institution groups, the differences between mean scores were small and without significance (Table I).

TABLE I.—*Deviation Score Means. All Groups* (1,955 *cases*).

Group.	N.	Mean score.	S.E.	S.D.
(1) Control	450	+0·87	±0·17	25·13
(2) Well adjusted	100	−1·12	±0·20	13·87
(3) Clinical 1	265	−0·63	±0·21	23·73
(4) ,, 2	413	+2·54	±0·18	26·14
(5) ,, 3	383	+0·58	±0·21	28·73
(6) ,, 4	236	−0·39	±0·24	25·87
(7) Institution	108	+11·86	±0·40	29·18

(2) *Score and C.A.*

A regression of score on chronological age of 0·1 (i.e., −0·7 points of score per year) indicated that any relationship between these factors was statistically insignificant.

(3*a*) *Score and M.A.*

A similar regression (0·1) of score on mental age showed that there was also no significant association between these two factors.

(3*b*) *Score and I.Q.*

A correlation of + 0·04 (S.E. ± 0·05) showed no significant association between these factors.

(4) *Type of Problem and Deviation Score Sign.*

Of the 1,297 subjects in the "problem groups" when those from the institution were excluded, there were 678 who could be grouped as behaving in ways which made them "active nuisances," and 619 whose difficulties were not manifested in overtly aggressive symptoms, who could be classed as "passive." When these two groups were arranged according to sign and extent of score there was a slight (2 per cent.) majority of cases in the active group, but score distributions for both groups were essentially symmetrical.

In the active group about half (52 per cent.) of the scores fell within the central range of deviations (— 17 to + 17), as compared with 55 per cent. of the controls and 46 per cent. of the passive group.

In the extreme ranges (i.e., those exceeding ± 52) there were nearly 4 per cent. of the active group and about the same percentage of controls, but 8 per cent. of the passive group.

Between the mean scores of the active and passive groups no significant difference was found, nor was there any significant difference between the means of either group and that of the controls. There were, however, notable differences in variance and standard deviation between the groups. Between control and active groups these differences were negligible, but between control and passive, and active and passive groups, the differences showed a high degree of significance.

While, of those 26 subjects in the active group whose scores exceeded ± 52 a majority had positive deviations, among the 51 subjects classified as passive, and with scores exceeding ± 52, less than half had positive deviations. Further inquiry, however, showed that any association between problem type (active/passive) and sign of deviation score (—/+) among subjects with scores exceeding ± 52 was relatively insignificant.

TABLE II.—*Distribution of* 1,297 *Cases according to Behaviour Type and Deviation Score.*

Deviation scores.	Actual incidence.			Percentage incidence.		
	Active.	Passive.	Total.	Active.	Passive.	Total.
+53 and over	16	24	40	40	60	100
+18–+52	159	143	302	53	47	100
—17–+17	349	284	633	55	45	100
—18–—52	144	141	285	51	49	100
—53 and under	10	27	37	27	73	100

(5) *Sex Differences.*

The deviation scores for each of the two sexes were symmetrically distributed, both when subjects from all sources were grouped and when they were classified. In the control and well adjusted groups the differences between the mean scores for the two sexes were small and without significance. A more marked sex difference was found, however, when all the problem groups, including that of the institution subjects, were amalgamated. When the institution subjects were extracted, however, and the remaining subjects classified into clinical groups, there was no significant sex difference in groups 1 and 4, a just significant difference between the sexes in groups 2 and 3, and an obvious difference between the mean scores for the two sexes only in the institution group.

TABLE III.—*Sex Differences in Deviation Score Means.*

Group.	Sex.	N.	Mean.	Diff.	S.E. of diff.
Control	M.	236	+1·10	0·48	2·45
	F.	214	+0·62		
Well adjusted	M.	65	0·00	3·20	2·70
	F.	35	−3·20		
All problems	M.	838	−1·30	7·28	1·20
	F.	567	+5·98		
Clinical 1	M.	234	−1·35	6·08	4·41
	F.	31	+4·74		
,, 2	M.	176	−0·72	5·68	2·58
	F.	237	+4·96		
,, 3	M.	231	−1·79	5·98	2·93
	F.	152	+4·19		
,, 4	M.	143	−2·74	5·98	3·99
	F.	93	+3·24		
Institution	M.	54	+2·85	18·02	5·09
	F.	54	+20·87		

(6) *Weighting Profiles and Problem Types.*

Four distinct types of profile made by the successive subtest weightings were noted in the course of the analysis. No mention of this had been made by the authors of the scoring system, so the possibility of there being any significant association between profile type and problem was investigated.

The profiles were classified as under:

C (consistent), in which the successive test year scores were either all −, or all +, throughout the whole test range.

B (broken), in which an otherwise consistent pattern of −, or + scores, was interrupted by not more than one reversion to the opposite sign.

R (reversing), in which there was first a succession of either − or + test year scores and then a change to scores with opposite sign, this being maintained throughout the remaining tests.

L (labile), in which, throughout the range of test year scores, there were frequent reversals of sign.

A symmetrical distribution of deviation scores was found with each type of profile. When comparisons between the percentage incidence of the four types in the control, well adjusted and amalgamated problems groups were made, the well-adjusted group alone appeared to show any obvious difference in distribution. When, however, the problem groups, including institution subjects, were classified according to behaviour into clinical groups 1–4, further differences in profile distribution were apparent.

TABLE IV.—*Percentage Distribution of Profiles* (1,955 *cases*).

Groups.	C.	B.	R.	L.	Total.
Control	23	18	30	29	100
Well adjusted	8	16	37	39	100
All problems	25	17	31	27	100
Clinical 1	19	15	27	39	100
,, 2	20	19	33	28	100
,, 3	30	16	33	21	100
,, 4	34	18	27	21	100

Since the C type profiles were conducive to higher deviation scores, a distribution was then made, according to profile type and behaviour, of the 1,094 problem subjects whose scores lay within the more restricted range of deviations ($\pm$ 32) within which all profile types were found. A χ^2 (9 degrees of freedom) of 32, giving P — ·001, for association between problem and profile type, indicated the highly significant heterogeneity of the groups of problem subjects. In the profile distributions of subjects in clinical groups 1 and 2 there was a greater incidence of lability and a lesser incidence of consistency than normal expectancy would suggest. Among subjects in groups 3 and 4, however, this position was reversed, the incidence of labile profiles being less than expectation, while that of the consistent type exceeded it.

From inspection it was clear that profile type and range of test scatter tended to vary directly with each other, the consistent profiles being found more generally among records with responses spread over a narrower range of test years, and the labile type more commonly among those in which the responses spread over a wider range of years.

(7) *Test Scatter and Type of Problem.*

Most of the inquiries into test year scatter on the Binet scales were made before 1940, and hence on earlier forms of the test than the 1937 Revision. Although diagnostic value of scatter did not, in itself, form part of Myers and Gifford's inquiry, the considerable amount of data available for the present study afforded a good opportunity of considering this matter again with reference to the most recent revision. In Table V the institution subjects are included in clinical groups 1–4.

TABLE V.—*Test Scatter Means of Normal and Abnormal Groups* (1,955) *cases*.

	Problem groups.					
Groups.	1.	2.	3.	4.	Adjusted.	Control.
Mean scatter in years	5·1	4·7	4·4	3·8	4·8	4·5

The more obvious differences are those between the control group and groups 1 and 4; but, except between the control group and group 3, all differences had statistical significance.

(8) *Discussion.*

Among subjects aged 7–14 years, the only large and significant difference found between mean deviation scores was that between the control and institution group means, the difference here, + 11·9 points of score, being nearly as large as that found by Myers and Gifford (+ 14·4 points) between their normal and schizophrenic (mild and severe) adults. Any differences between the control and other groups in the present inquiry were insignificant (from − 1·3 to + 1·7 points), and were smaller than those found by Myers and Gifford between their normal and neurotic (− 1·8) and normal and affective disorder (+ 3·7) groups of adults.

The evidence, from much larger groups of children than were available to Myers and Gifford, appeared to refute their suggestion that an age adjustment to the scores was necessary in so far as this applied to subjects aged from 7 to 14 years. The lack of any significant correlation between mental age and deviation score, found by Myers and Gifford among adult subjects, was confirmed with reference to children with mental ages from 6 to 19 years.

The lack of significant relationship between sex and score found by Myers and Gifford was corroborated in all groups except that of the institution subjects, for whom a large and significant sex difference in mean score was noted. From other evidence, however, it seemed probable that this difference was referable less to the sex factor in itself than to the fact that, apart from problems associated primarily with their mental subnormality, the female high-grade patients frequently exhibitied behaviour difficulties of a type different from those found among the high-grade males.

Myers and Gifford's finding, that subjects with poorly integrated personalities tended to have large "plus" deviations, was supported in so far as in the present inquiry, large deviations were found among subjects showing a poverty of effort. No subjects in the well-adjusted group had scores exceeding ± 32, but in other groups where there were subjects with scores of more than ± 52, they showed, without exception, a serious degree of maladjustment. The data also indicated, however, that among children, aged from 7 to 14 years, whose social inefficiency was characterized by apparent passivity and unwillingness, or inability, to make such effort as normal living demands, there was an even greater tendency for their scores to have a heavy "minus" than a heavy "plus" loading.

The standard deviation for the scores of normal children was approximately that found by Myers and Gifford for normal adults. Whereas, however, Myers and Gifford found smaller standard deviations of scores among psychotic than among normal subjects, in the present inquiry, the standard deviations of the less stable children's scores were greater than those of the normal children, while those of the well-adjusted children were very much smaller than those of the control group.

Myers and Gifford did not concern themselves with test year score profiles.

In the present study, score profiles with consistent signs were found more commonly among the records of subjects in groups having the larger deviation score variances; labile patterns of deviation score signs were found, on the other hand, more frequently among the records of subjects from groups in which the score variances were smaller.

The results of profile analysis indicated an association between score profile type and emotional adaptability, but showed also that score profile type and test response scatter were closely connected.

An analysis of test year scatter offered evidence that what had appeared to be incompatible conclusions from certain previous inquiries were not in fact necessarily mutually exclusive. The smaller than average test scatter of subjects whose symptoms of maladjustment were seen in passivity and lack of self-sufficiency and, on the other hand, the larger than average test range found in the records of those whose difficulties caused them to be more actively a social nuisance, seemed to account, to some extent, for the diversity of opinions expressed in the past on the relative significance of test scatter.

(9) *Summary and Conclusions.*

The Terman Merrill (1937) Revision test records of 1,955 children aged 7–14 years were scored for response pattern according to a system devised by Myers and Gifford. Distributions of deviation scores according to chronological age, mental age, I.Q. and sex showed that there was little or no statistically significant association between the scores and these factors, apart from a significant sex difference in the mean scores of mentally defective institution subjects. This difference, however, was probably referable to a difference in the types of problem found among male and female high-grade patients.

No significant differences were found between the mean scores of subjects grouped according to problem type, but significant differences in score variance were found when inter-group comparisons were made. While the scores of a particularly well-adjusted group showed approximately only half the deviation score range of the control group, scores exceeding approximately 2 S.D. were found, without exception, in the records only of those subjects whose behaviour was characterized by a marked degree of social inefficiency or personal maladjustment.

Direction of deviation, — or +, gave no indication of type of behaviour problem; but consistency, or otherwise, of score signs throughout the test years was associated with range of test scatter and deviation score variance.

Though of little value, therefore, in differentiating between specific types of abnormal behaviour among subjects aged 7–14 years, in circumstances in which no information other than the test record of a subject was available, the system of scoring for response pattern would seem to afford a rough measure of personal integration and social adjustment, both for individuals and groups, within this age range.

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OBSERVATIONS ON EPILEPTIC AUTOMATISM IN A MENTAL HOSPITAL POPULATION.

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Introduction.

In recent years there has been renewed interest in correlating cerebral function with mental phenomena. For a time, with the advent of prefrontal leucotomy, interest in the frontal lobe reigned supreme. However, in recent years the temporal lobe has been coming to the fore, and is now beginning to rank with the frontal lobe in importance.

This study is presented not with the idea of producing something new, but merely to review present knowledge and underline the place temporal lobe disorder plays in mental hospital practice. With this aim in view, the epileptic population of this hospital was studied as a probable source of temporal lobe dysfunction.

Historical Review.

The psychical concomitants of epilepsy, at different times, have been known by various names such as psychic equivalents, epileptic equivalents, behavioural automatism and psychomotor epilepsy. This is an indication of the lack of a suitable term. In this paper the motor aspects are referred to as automatisms and the sensory aspects as dreamy states.

It appears that knowledge regarding the psychical phenomena of epilepsy has advanced in three main stages. The first stage was the clinical description and its correlation with pathological anatomy. Then, when the electroencephalogram was adapted for clinical use, a renewed interest in epilepsy occurred. This brought, initially, a desire to equate clinical types of epilepsy with wave patterns. However, this was impracticable, and the study of the origin of abnormal discharges has proved more fruitful.

Finally, the production of these psychical phenomena by direct stimulation of the exposed human temporal lobe at operation, and the relief from these symptoms following temporal lobectomy, has shown conclusively the great importance that this region of the brain plays in our adaptation to reality.

Jackson's belief was that the epileptic discharge was paroxysmal in nature, and consisted of an abrupt and excessive discharge in a localized area of cerebral grey matter. The spread of this discharge accounted for the motor manifestations which occur during a fit. He further stated that "strong epileptic discharges paralyse the nervous centre (or much of it) in which they begin or through which they spread."

Jackson, between 1875 and 1880, wrote a number of papers on temporary mental disorders after epileptic discharges. He firstly drew attention to the

fact that the behaviour is of a kind that not infrequently brings the patients in conflict with the law. Jackson divided the mental behaviour into motor and sensory phenomena. The motor aspect he labelled automatism, and the sensory phenomena the dreamy state. He believed that they were both due to release from higher centres paralysed as a result of the epileptic discharge. The behaviour varied in complexity from almost normal to violent raving, and he postulated that the slighter the preceding fit the more normal was the action. Unlike Falret (1860), who suggested that the abnormal behaviour may be an equivalent of a convulsive fit, Jackson believed all such action to be post-epileptic even though the preceding fit may be so slight as to escape recognition.

The dreamy state is a complex frame of mind, variously described, which precedes a fit and may early in the history of a case be the sole evidence of epilepsy.

Jackson drew attention to the double mental state that exists, namely, a defect of consciousness coupled with the dreamy state or automatic action. If automatic action follows a dreamy state, loss of consciousness always comes between them. The dream may be remembered, but not the actions.

At times crude sensations accompany the dreamy state. They are referred chiefly to the epigastrium or to the sensation of taste or smell. The sensation of taste may be followed by masticating or spitting movements. The epigastric sensation is often accompanied by the emotion of fear.

The association of a crude sensation of taste or smell, with an elaborate mental state, occurring on its own or preceding convulsions, and sometimes followed after slight attacks by elaborate movements and actions, was found to be due to involvement of the tempero-sphenoidal lobes (Sanders, 1874; McLane Hamilton, 1882; Anderson, 1887; Jackson, 1888; Jackson and Beevor, 1890; Jackson and Colman, 1898; Jackson and Stewart, 1899). The cases of McLane Hamilton and Jackson and Colman are worthy of special note, as the pathology in the former case consisted of cortical scarring and atrophy of the right uncinate gyrus, while in the latter a small patch of cystic softening in the left uncinate gyrus was found. In these cases the localized pathology is of more value than the more common tumours, where far-reaching invasiveness makes correlation of symptoms with localized disease of cortical areas impracticable.

Crichton-Browne (1895), in discussing dreamy states, noted that in epilepsy they were frequently accompanied by visceral disturbances and/or a feeling of fear and horror. They were especially liable to occur in patients when alone or falling off to sleep.

With the turn of the century a number of papers appeared on the temporo-sphenoidal syndrome, confirming the location of the lesion and the complex symptomatology. Clarke (1900), Buzzard (1906), Mills (1908) and Foster Kennedy (1911) may be mentioned. Foster Kennedy reviewed nine cases of tumour confined to the temporal lobe and pointed out the difficulty in diagnosis, especially on the right side, and the fact that the patient may be thought to be suffering from hysteria. In all the cases an aura of some kind was present. Major seizures usually precede, sometimes for years, the onset of psychic aurae.

Foster Kennedy likewise noted the double mental state of lowered objective consciousness and enhanced subjective consciousness in the so-called dreamy states, which were not infrequently accompanied by crude sensations of taste and smell or epigastric sensations accompanied by an intense sense of fear. The dreamy state was variously described, "everything has changed, yet different"; "a feeling of reminiscence as if everything had happened long, long ago." Often these mental states in cases of tumour are still further complicated by the appearance of actual hallucinations.

Kinnier Wilson (1928) classified the dreamy states in four main groups :—

1. The familiarity or *déjà vu* type.
2. Unfamiliarity, strangeness or unreality type.
3. The "Panoramic memory" type.
4. The incomplete or abortive type.

Wilson pointed out that the first three groups may well merge into each other and the combination of one or other of these groups with gustatory or olfactory hallucinations constitutes the uncinate fit. He felt, unlike Jackson, that these complex symptoms may be considered as an aura, as they bear the same relationship to a fit as any other aura.

Gibbs, Gibbs and Lennox (1937) introduced the term "psychomotor epilepsy" to cover the various psychical accompaniments of epilepsy on the basis of a distinct E.E.G. classification (*vide infra*).

Penfield and Erickson (1941) likewise stated that the dreamy state occurred during an actual epileptic discharge, and was not a release phenomenon, as Jackson suggested. They divided their dreamy states into—

1. Illusional seizures.
2. Hallucinatory seizures.

In the authors' experience the dreamy state is produced by epileptic discharge within the temporal lobe.

Automatism was considered to be either post-epileptic or possibly epileptic in origin. They described it as a state of complicated activity occurring in a person who is in a state of defective consciousness and most often seen after an epileptic fit. Understanding is grossly impaired, but the ability to move and act remains unimpaired.

Gibbs, Gibbs and Furster (1948) found that out of three hundred patients whose E.E.G. conformed to the psychomotor pattern, 90 per cent. had attacks of automatism or psychomotor epilepsy. They analysed the pattern of behaviour, and found that confusion was usual and that amnesia for actions invariably occurred, but consciousness was not usually lost. The movements appeared purposeful, but were poorly co-ordinated and were chiefly repetitive. During the automatism evidence of fear and rage may occur and be accompanied by screaming. They likened the whole performance to "a person acting out a bad dream."

Penfield (1949) showed that automatisms may be classified according to their origin as temporal or frontal. Temporal automatism is the most elaborate. In it the patient appears cut off from his previous experience and his attack is "psychoparetic" rather than "psychomotor."

Penfield and Flanigin (1950) and Jasper, Pertuisset and Flanigin (1951) found that automatism was present in less than half of their cases of temporal lobe seizures subjected to operation.

Penfield and Kristiansen (1951) and Penfield (1952) reviewed a series of 259 patients with focal epilepsy, and in 222 cases the localization of the initial discharge was determined. Temporal lobe foci formed a significant proportion and were frequently associated with automatism and dreamy state. Frontal automatism was characterized by stereotyped thinking or behaviour.

Gibbs (1951) and Bailey and Gibbs (1951) in a large number of cases emphasized the important relationship of the anterior temporal focus with automatic behaviour.

Magnus, Penfield and Jasper (1952) found automatism to be frequently associated with masticatory attacks. The fits were frequently preceded by an aura, and in about half of the cases turning of the head to the contralateral side occurred. This turning of the head to the opposite side was considered to be of diagnostic importance, as it is often the only clinical sign to indicate the side of the lesion. However, Paillas and Subivana (1950) in an excellent monograph on the temporal lobe found that rotation of the head may be to the ipsilateral side. Hill (1953), using basal electrodes, has been able to demonstrate a temporal focus very frequently in cases with automatism. In an earlier publication (Hill, 1949) temporal foci were found less frequently, probably owing to the less refined technique used at the time.

Hill and Watterson (1942) and Hill (1944) commented on a group of aggressive psychopaths who had E.E.G. abnormalities localized in the temporal areas, and Hill found that the most violent and aggressive psychopaths had E.E.G. foci in the right posterior temporal regions. The association of the difficult, anti-social personality known as the epileptic personality with the "psychomotor" type of epilepsy was noted by Belinson (1947) in an epileptic colony. This observation was confirmed by Gibbs *et al.* (1948) while Gibbs (1951) showed that control of the automatism by phenurone produced in those patients who had a difficult personality a severe disturbance reaching psychotic intensity.

Rey, Pond and Evans (1949) have reviewed the whole problem of personality disturbance associated with temporal lobe dysfunction. In addition they showed that in their "idiopathic" cases of temporal lobe epilepsy, irrespective of sex, the epileptic abnormality tends to be more common on the left than the right. However, even though the E.E.G. abnormality is more common on the left in both sexes, there are significantly more right-sided epileptic E.E.G.'s in males than females. Green, Duisberg and McGrath (1951) similarly found a higher incidence of left temporal foci as compared with the right, but their cases were chiefly due to acquired lesions. Gibbs *et al.* (1948) found that right-sided foci were more frequent than left. Gastaut (1950), although he found more cases with left-sided foci than right, felt that the difference was not significant. These latter authors do not discuss the etiology of their cases.

Gibbs, Gibbs and Lennox (1937, 1938*a* and *b*) stated that psychomotor epilepsy was associated with 4–6 cycles per second flat-topped waves. Jasper (1941) and Jasper and Kershman (1941) pointed out that this rhythm was

non-specific. However, 6 cycles per second slow waves commonly occur in psychomotor epilepsy. Both the character of the wave and the localization is of importance. Sharp waves localized in the temporal lobes in the inter-seizure record were frequently associated with visceral aurae and complex disturbances of thinking and behaviour. If the sharp waves were accompanied by 6 cycles per second waves automatism was prominent. The 6 cycles per second waves are probably caused by a deep-seated focus buried beneath the temporal lobe firing along corticothalamic pathways and then being relayed back to the cortex.

The pattern of psychomotor epilepsy or behavioural automatism is not, then, specific, but merely a form of focal epilepsy arising within the temporal lobe. Lennox and Brody (1946) showed that similar 6 cycles per second rhythm of psychomotor epilepsy may be caused by subcortical lesions occurring in the basal ganglia, thalamus and hypothalamus and even the cerebellum. Gibbs *et al.* (1948) investigated three hundred cases whose E.E.G. showed a psychomotor record, and found in all cases a spike focus in the anterior temporal area on one or both sides. They showed that this spike focus was best demonstrated during natural or induced sleep. Furster, Gibbs and Gibbs (1948) describe a method of inducing sleep by pentothal in order to bring out the sharp waves. Under normal waking conditions only 30 per cent. of their cases show such a focus.

Hill (1949) described the typical genesis of a psychomotor attack which may be either bi- or unilateral. After a transitory initial period of suppression 6 cycles per second low voltage waves appear. The amplitude of the waves increases while the rate drops to 2 cycles per second, before giving rise to slow, irregular waves of cerebral exhaustion. The bilateral cerebral discharge is associated with automatism, while the unilateral discharge is associated with the dreamy state.

Gastaut (1950) confirms these observations. Jasper *et al.* (1951) obtained similar results on their corticograms. In 75 per cent. of their cases localization was possible to one temporal lobe, while in the remaining 25 per cent. the E.E.G. revealed bilateral independent foci.

Localization of clear spike reversal in the E.E.G. using ordinary scalp leads is difficult, as frequently the focus is in the tip of the temporal pole or hippocampal formation or deep in the Island of Reil, and conduction through the brain causes the spikes to spread out to slow waves. MacLean and Arellano (1950) and MacLean (1950) emphasized the importance of basal leads in order to localize clearly the spike focus in the temporal lobe. They used pharyngeal and tympanic leads. Jones (1951) introduced needle electrodes inserted laterally between the zygoma and sigmoid notch of the mandible until they came to rest against the base of the skull, lateral to the foramen ovale.

Penfield and Erickson (1941), and more recently Penfield (1949) and Penfield and Rasmussen (1950), have described how electrical stimulation of the temporal cortex which has previously been sensitized by epileptic discharge may produce elaborate psychical states. The action progresses as in a dream until the stimulating electrode is withdrawn. The area of cortex producing the particular aura of which the patient complains may, by this technique, be

accurately delineated prior to excision. In addition, Penfield (1952) described automatism produced by stimulation of the temporal lobe.

The results of the surgical treatment over a 10-year period of 55 cases of atrophic lesions of the temporal lobe producing epilepsy, have been described by Penfield and Flanigin (1950) and Jasper *et al.* (1951). All the cases had previously failed to respond to medical treatment. The results were extremely good in 52 per cent. while a further 25 per cent. showed at least 50 per cent. improvement.

In the unilateral group as determined by pre-operative E.E.G. two out of three showed a decided improvement or cure, while in the shifting focus group the results were poor.

Green, Duisberg and McGrath (1951) operated on 23 cases with psychomotor epilepsy. Gross or microscopic pathology was found in 14 cases, and in general these cases benefited more from surgery than those who showed no pathology. Following operation 12 patients had no psychomotor seizures, and a further 9 patients showed a reduction in the number of attacks. They found that personality defect from operation was negligible. It tended to bring about a "tameness of personality."

In their pre-operative E.E.G.'s they found that the traumatic cases had slow activity mixed with spikes or slow waves, and spiking alone occurred in cases with no demonstrable pathology.

Bailey and Gibbs (1951) operated on 25 cases. The extent of excision ranged from gyrectomy to lobectomy. In general they found that the more radical excisions gave better results.

Method.

All the patients in the hospital, who, in an arbitrary period of a month, suffered from epilepsy, were noted. In all cases hospitalization ranged from months to years. They were then subjected to a full clinical and electroencephalographic examination.

The clinical examination included a careful history, objective where possible. This was not always possible, however, for a number of the patients had been transferred to this hospital from other institutions. A description of the form the fit takes in these patients was obtained from the nursing staff, but in a number of cases fits have been personally seen.

The electroencephalographic examination was carried out with the subject fasting and off medication for the previous forty-eight hours. A six-channel inkwriter Ediswan machine was used with a write-in analyser. If necessary, activation of a focus was obtained by sleep induced by seconal gr. iii orally. Scalp electrodes only were used.

Results.

In the hospital, at the time of the survey, there were 1,110 patients, composed of 419 males and 691 females. The number of epileptic patients was 47 (4·3 per cent.) made up of 25 males and 22 females.

These epileptics were then assessed clinically and found to fall into three distinct groups as judged by prominent concomitant features, which refer to

intelligence in two groups and behaviour in the remaining group. These criteria are thus not strictly comparable but the scheme was designed purely as a pragmatic means of classifying epileptics in mental hospitals.

The first group was composed of feeble-minded or imbeciles. Their fits had originated at a very early age, and so interfered with their lives that they were uneducable and never able to work ; and often, because of their uncertain behaviour, required hospitalization early in their life. This latter observation is particularly true of the males, but a number of the female patients were kept at home and looked after until either increasing age or death of the relatives made control impossible. This group is comprised of cases of mixed etiology such as Sturge-Weber syndrome, juvenile Tay-Sachs' disease and congenital syphilis. Often in these cases the epilepsy is of minor significance.

The second group comprises those patients whose post-epileptic automatisms made their admission imperative. Also, the so-called epileptic personality was prominent, and must have made them uncomfortable companions with whom to live. This group will be studied in more detail later.

The third and last group comprised those people who were admitted to hospital because organic dementia had commenced. They were no longer able to earn their living or care for themselves. Organic dementia was diagnosed by increasing forgetfulness ; a tendency to live in the past, often marked, and disorientation for time coupled with neglect of appearance. Many of these cases owe their admission to incipient arteriosclerosis or acquired disease rather than epilepsy. Even those who have had epilepsy for many years were able to adapt successfully until arteriosclerosis supervened.

TABLE I.

	Feeble-minded.	Automatism.	Dementia.	Total.
Male	9 (36%)	13 (52%)	3 (12%)	25
Female	9 (41%)	5 (23%)	8 (36%)	22
Total	18	18	11	47

It would appear from these figures that there is a sex differentiation between automatism and dementia. The size of the group is not sufficient to be certain of this finding.

The average age of the various groups is shown in Table II.

TABLE II.

		Feeble-minded.	Automatism.	Dementia.	Total.
Male	M.A.	38·2 yrs.	38·75 yrs.	54·3 yrs.	40·4 yrs.
	S.E.	3·2 ,,	4·58 ,,	6·4 ,,	2·9 ,,
Female	M.A.	50·6 ,,	53·4 ,,	65·8 ,,	56·8 ,,
	S.E.	3·4 ,,	6 ,,	2·6 ,,	2·7 ,,

M.A. = mean age. S.E. = standard error.

It may be seen from Table II that the average age of the male patients is significantly younger than the females, and this tendency derives directly from the subgroups.

Clinical Description of Epileptic Automatism.

All the cases which have been included in this category exhibit, at times more or less frequently, epileptic automatism. The automatism is probably post-epileptic. At some time or another a preceding fit, even though slight and transitory, has been observed in every case. Three types of preceding fit may be distinguished. *Grand mal* or typical major epilepsy occurs in three cases, two women and one man; "adversive" attacks in three men, and in ten cases minor seizures, consisting of blanching of face, staring ahead, going momentarily stiff and sometimes twitching of the mouth, precede the automatism. This latter group seems to conform to the type labelled "psychomotor epilepsy" by Gibbs *et al.* (1937). Lastly, two of the male patients have either *grand mal* or adversive attacks preceding their automatic behaviour. It should be noted that every fit is not necessarily followed by automatic behaviour, and all the patients have experienced attacks of *grand mal*. It is usual in our series for *grand mal* to have preceded the appearance of "psychomotor" epilepsy for several years, and when the patients were young this *grand mal* was frequently accompanied by *petit mal*. Even when "psychomotor" epilepsy is fully established occasional major fits still occur.

Prodromata are frequently observed by the nursing staff often one or two days before the fit manifests itself. They take the form of increasing restlessness and hostility. The patients suspect that the nurses are holding back food from them, that they are being put upon and made to do more work than their share. They quarrel with other patients and become the centre of violent arguments. Others sulk and shrug off any approach to them, and refuse to work and become withdrawn and unsociable.

In this group most of the patients, 15 out of 18, have a well-marked aura that precedes the fit. If the three cases, in which an aura did not occur, are examined, it is seen that two of these patients suffered from *grand mal*, while a third had adversive fits. Retrograde amnesia for an aura sometimes occurs, and knowledge of an aura is gleaned from the patients' behaviour. One patient would point and say "See them!" before the onset, while another would complain of a strange sensation in the stomach and ask for help, as he suddenly felt ill immediately before the turn. In two cases remembrance of an aura remained, but the contents of the thought could not be recollected. The descriptions of the aurae may be seen in Table III. It is impossible to classify them except broadly into psychic aurae and visceromotor groups. In the first group would be included the hallucinations (three cases); the remembered melody (one case); the forgotten ideas (two cases); the feeling of strangeness (one case) and the cephalic aurae (one case), giving a total of eight cases, while in the visceromotor group would be included the giddy sensation (three cases). The epigastric group (four cases) with sensations of intense terror in two, feeling very ill in one, and choking in the fourth, form a connecting link between the two groups, as this group has both visceral and psychic components. Not infrequently attacks, in which only the aura is experienced, occur especially before going to sleep. In these cases the aura is often hallucinatory or an epigastric sensation associated with terror. This latter aura is especially

TABLE III.

	Initial commencement of fit.	E.E.G. focus.	Etiology.
F. D. W—, 28 yrs.	Visual hallucination, major fits or turning head to left and jerking left arm	Right temporal	Childhood onset of fits.
W. J. W—, 60 yrs.	Epigastric sensation	,, ,,	Ditto.
T. P. L—, 36 yrs.	Epigastric sensation accompanied by intense terror.	Left and right temporal (independent). Left focus more prominent.	,,
F. J. P—, 47 yrs.	Head aura — something moves in the head	Left temporal	Severe head injury.
S. G. B—, 57 yrs.	Visual hallucination "Has a presentiment."	Left posterior temporal delta focus	Started 8 years ago. Cerebral tumour.
S. E—, 49 yrs.	Turns to right	Left temporal	Calcified haemangioma.
A. L. B—, 36 yrs.	Visual hallucination. Major fit	Right temporal	Childhood onset of fits.
R. B—, 21 yrs.	Thought impossible to remember. Jaw champing	,, ,,	Childhood onset
A. W. H—, 38 yrs.	Intense terror. Epigastric sensation. Jaw champing	,, ,,	,, ,,
I. T. L—, 59 yrs.	Dizzy feeling. Major and adversive to left	,, ,,	Shrapnel in right anterior temporal lobe.
J. H—, 48 yrs.	Feeling of strangeness	,, ,,	Severe head injury.
L. M. G—, 25 yrs.	Choking sensation in throat. Turning to left	,, ,,	Old temporal lobe abscess scar. Right side.
M. G—, 18 yrs.	Bells ringing or remembered melody. Turning to right	Left temporal	Severe head injury.
E. C. F—, 72 yrs.	Giddy sensation. Occasional jerking in right limbs	Left and right independent foci. Left focus most prominent	Started in childhood.
E. D. H—, 33 yrs.	Sensation that cannot be described. Jaw champing. Turning of head to right	Right temporal focus	Ditto.
A. D—, 64 yrs.	Giddy sensation	Right temporal	Calcified cyst over right anterior temporal lobe.
R. E. O—, 48 yrs.	*Grand mal*	,, ,,	Childhood onset.
M. W—, 37 yrs.	,,	,, ,,	Ditto.

unpleasant to the patients, one of whom remarked, "I'd rather have a hundred fits than that sensation," while another had contemplated suicide because of it. In none of our cases was any evidence of an aura of a strange smell or taste elicited, although in three cases of transitory preceding fits typical jaw champing and swallowing occurred sometimes. These masticating attacks followed rapidly after the appearance of pallor, and may be considered automatisms as suggested by Magnus, Penfield and Jasper (1952). In our cases there was likewise no remembrance of the actual chewing.

Following *grand mal* seizure the automatic actions are vague, poorly sustained and not at all elaborate. Immediately after the fit the patients lie still in a dazed fashion for a few minutes, and may even sleep during this period before the abnormal behaviour commences. These people are mostly violent and destructive, and sometimes this was so excessive that they actually became homicidal. This group comprises the so-called epileptic furor. If these patients are placed in a quiet side-room after an attack so that they are free from distraction they often remain quiet, but if someone enters they rise in a menacing fashion, and if one is careless they are liable to attack with blind fury.

In order to try and control the violence prefrontal leucotomy was performed on four of these patients in the past. In three of them it reduced the number of major fits and took the "bite" out of their automatisms. These leucotomised automatons became but "ghosts of their former selves"—truculent but not so hasty in action and less vicious and violent. The male patient who had both major and adversive attacks, now since leucotomy has chiefly the latter, and the furors that followed his major attacks have ceased. His automatic behaviour following his adversive attacks remains unchanged.

The "adversive" attacks come next in order of severity as regards initial discharge. In them consciousness appeared clouded from the start in all except one who could sometimes remember the turning of his head. Although consciousness was impaired the patient did not necessarily fall. In the attack the head and trunk were turned to one side and the arm on this side was abducted from the midline. The turn may cease at this tonic phase, or jerking of the arm and face may occur for a few moments. The whole attack is generally over within one or two minutes. Sometimes the full adversive attack may be replaced by turning of the head only and transient jerking of the arm and leg on the side to which the head turns. Occasionally a few jerks may later occur in the opposite arm. If the tonic movements increase in frequency the attack invariably passes into a major fit. The behaviour following upon these turns is more organized and purposeful than following on *grand mal*. Frequently this is the full extent of the attack, but when automatic behaviour occurs it falls midway in complexity between that following *grand mal* and the minor attacks.

Case 1.—F. D. W.—, 28 years. Went white, head turned to the left and left arm was abducted from the side. After five to ten seconds a few transitory jerks of left arm occurred. For a few seconds he remained lying quietly on the couch, and he then got up and looked round rather vaguely and examined his clothes. He was told to sit, which he did for a few seconds, and then got up and picked up the chair and said, "I must sit outside." He then made to leave the room with the chair. If the chair was taken from him he became abusive but returned to the self-same task of trying to take the chair outside. This perseveration of action persisted until the fit passed off after a few further minutes. Afterwards he was completely amnesic for the whole turn.

The salient points are the well co-ordinated actions which are in themselves purposeful but nevertheless rather absurd, and the purpose and tenacity with which the patient returned to the same task when he was separated from the chair. When prevented from carrying out this task he became verbally abusive but never physically violent, for his actions were directed solely to

carrying out his self-appointed task for a reason afterwards not known to himself. This case, although typical of this division, was purposely chosen, as he had had a leucotomy which had in no way changed this behaviour, although it had dealt successfully with the blind fury following on his major fits. It perhaps illustrates how leucotomy affects the emotional rather than the purposive aspect of behaviour.

This is a typical form of automatism following such an adversive attack.

Following the transient attacks the automatism is more in keeping with what the patient was doing immediately prior to the attack. In fact one of the patients (A. H—,Case 2) told the author that generally no one knew he had had a fit. He himself only knew afterwards because of some odd mistake he had made.

Case 2.—A. H—, 38 years. He was a clerk and would be adding up a column of figures when the attack would occur. To other people he would appear to carry on as if nothing had happened. When he came to he would discover that he had written in something irrelevant or the wrong figures. A fit was witnessed when he was reading a book. The book was laid down for a minute as he stared and a slight chewing of the mouth occurred. He immediately lifted the book up, but upside down, turned over the pages and looked puzzled, so he put the book down and walked to the window. When spoken to he was vague but answered courteously. The whole fit passed off within three minutes.

In this type of attack a usual course of action is for the patients to search diligently for some object that they feel they have lost. They are painstaking and thorough in their search. Perhaps it is that they are searching for the lost part of themselves.

The "adversive" attacks and the minor fits have one other point in common. At the start of the automatism they not infrequently finger their clothes and peer at themselves as if to assure themselves that they exist and have substance. During this phase they appear perplexed. Once they have done this they embark on their automatic actions. Perhaps the distinction between these two groups is arbitrary, but in the case of the behaviour following minor fits it appears easier to understand and more in keeping with previous activity; also their actions vary more and are richer in character.

Although induced sleep will often activate "spikes or sharp waves" in the E.E.G., the incidence of nocturnal fits in this group of patients was in no wise increased when compared with the other groups. Indeed, nocturnal automatism was excessively rare, which is an interesting contrast to somnambulism. However, the major seizures of these patients seem especially liable to arise during sleep.

The most frequent time for the "psychomotor" fits to occur is at the meal table. When this is the first manifestation it causes consternation in the family for it is seldom recognized for what it is. In the seizure the patient will suddenly start putting food into his pocket or help himself from the plate of someone else. Often the social effects are startling. One of the patients, while on a railway journey, was seated in a restaurant car when she got up in her seizure and started to clear her own and the neighbouring table in the middle of the meal. When restrained she became very abusive.

In all the cases, prior to admission, there was a failure of anti-epileptic drugs, either alone or in combination, to control their fits.

Reason for Admission.

Violent, uncontrollable behaviour is the prime cause of admission to a mental hospital. Eleven cases were so admitted, either direct from home or from an epileptic colony, and in three cases by direct police action.

When the typical " psychomotor " attacks are considered the reason for admission appears to be somewhat different. Three cases sought admission as voluntary patients because of the anxiety they had engendered in their relatives and in themselves by their sudden inexplicable behaviour.

A further four cases were admitted in an acute psychotic episode which seemed to follow the same pattern in each case. For a week or so prior to the onset of the acute episode there apparently occurred a progressive increase in the number of " psychomotor " seizures. This had the effect of making them dazed, and interfered considerably with their work. The deterioration of work in due course brought about a reprimand which caused a flare-up of acute paranoid feelings against their immediate superior. They then rapidly passed into an acute psychosis. One patient, at this stage, believed that his employer was trying to trap him and cast suspicion on him for some misdeed.

In the acute psychotic phase they are actively hallucinated and display increased activity, becoming extremely restless. They talk incessantly. Their mood swings between ecstasy and terror. In the ecstatic mood they see the crucifixion and are at one with the universe, while in the states of terror they cower away and strike out blindly. In this stage they see lizards, spiders or black beetles crawling over them. For the most part, however, an ecstatic euphoria reigns, so that they smile happily to themselves. In this episode they are completely disorientated for time and often for place, but they retain knowledge of their own identity. Bizarre ideas occur due to erroneous perceptions, as with the man who insisted on trying to open all the clocks, as he thought birds were imprisoned in them. Misidentification of people with the past occurs, and may be the cause of assaults on other patients. Throughout a strong element of suspicion is ever ready to crop up for brief periods. This chiefly happens when misidentification occurs. Afterwards there is a considerable amnesia for their conduct . However, a vivid recollection of the hallucinations, especially of the fearful ones, remains. This phase lasts for several days, improvement being gradual over a week or so.

Epileptic Personality.

The personality of the group showing behavioural automatism is abnormal. It is present to a much greater degree in this group than in the other two groups of epileptics previously described. The basis of the personality disturbance is aggressivity and hostility, which is a common factor and runs through this whole group. These patients may have, apart from this, totally different attitudes to life. Common amongst these are obsessional features, in which there is a need to write everything in a diary and keep everything in its right

order. Others are solitary and moody and keep to themselves, showing a much more schizoid temperament, while others are social and form little cliques among themselves. This latter group is often the greatest problem as they tend to "hunt in packs" and support each other in trouble, either with alibis or actual defence. They more readily verbalize their hostility, and form the hard core of querulous troublemakers.

All have in common a great self-regard and are quick to take offence, and imagine all references as personally directed against themselves. They hold grudges for long periods and are full of petty little tricks to annoy the ward routine. However, the greatest interest is in the liability to violent short-lived and unprovoked outbursts. They correspond closely to the severely aggressive psychopaths described by Hill (1944) and Hill and Watterson (1942), and in common have frequently a right temporal focus. Again the build-up of aggressivity before an attack with subsequent amelioration afterwards is in keeping with the antithesis suggested by Gibbs (1951) between epilepsy and personality disturbance in the temporal lobe dysfunction.

Ström-Olsen, Last and Brody (1943) and Ström-Olsen (1946) pointed out that prefrontal leucotomy made the aggressive epileptic patients more docile. By removing some of their initiative it has often quietened down their explosive outbursts so that it is easier to live with these people.

Treatment.

In hospital the various anti-epileptic drugs in various combinations have been tried. The drugs chiefly used are phenobarbitone, phenytoin, 'Mesontoin' and 'Mysoline.' In the behavioural automatism, effects, for the most part, are but transitory. Hospitalization in a protected environment seems perhaps to produce the best results.

The psychotic episodes rapidly settle down after admission, and a substantial proportion of the patients are able to be employed about the hospital. In fact, active employment is perhaps the most potent means of keeping the attacks at bay. If the attacks are not controlled by work or drugs a rapid deterioration occurs. These patients resemble more closely deteriorated schizophrenics. They become withdrawn, asocial and manneristic. Their speech becomes slurred and they are given to mumbling Following a fit they show a recrudence of activity, and for a while are abusive and exhibit purposeless activity.

When leave is granted to a supposedly stabilized patient a rapid deterioration generally occurs. The attacks are thus only controlled in a hospital environment. The prognosis, therefore, with the usual means of treatment, in these patients is poor. Surgery, in the form of temporal lobectomy, offers a more hopeful outlook. As yet it is too early to judge the lasting results of this form of therapy, but early results are hopeful.

Correlation of E.E.G. Findings and the Epileptic Groups.

The types of E.E.G. abnormalities obtained in the epileptic population of this hospital may be clearly seen in Table IV. As is to be expected, the feeble-minded and demented groups, which are clinically not of a pure composition,

TABLE IV.

E.E.G.	Feeble-minded.	Automatism.	Dementia.
Temporal focus	3	18	2
Other foci	—	—	2
Spike and wave	9	—	—
Other paroxysmal symmetrical rhythms	3	—	3
Asymmetrical abnormality	2	—	3
Non-specific	1	—	1
Total	18	18	11

showed diverse E.E.G. findings as compared with the automatism group. However, in the feeble-minded group spike and wave is a conspicuous concomitant, and is a constant finding in those whose epilepsy is the main cause for their backwardness. The heterogeneous etiology of the remainder accounts in large measure for the other E.E.G. abnormalities. In the dementia group there is no clear-cut specific E.E.G. abnormality. If all groups are considered together, then a temporal focus is the commonest E.E.G. abnormality; it is present in 50 per cent. of the patients, and in 78 per cent. of these cases is associated with automatism.

E.E.G. Findings in Automatism Group.

Focal activity was shown to be present in all of those patients who had epileptic automatism as a prominent symptom. A focus was deemed to be present when phase reversal of abnormal activity occurred about a common electrode. This abnormal activity was of "sharp wave" or spike discharge in all but two cases, where it was by slow wave of less than four cycles per second. These two cases had a gross pathology.

Twelve of the thirteen male patients in the automatism group all showed a constant unilateral temporal focus. This was anterior in all except one case, which was a posterior delta wave focus due to a cerebral tumour. In the female group four out of five patients showed a constant anterior temporal focus. The two remaining cases, comprising one male and one female, showed bilateral independent anterior temporal foci. The laterality of the foci are shown in Table V.

TABLE V.

	Right temporal focus.	Left temporal focus.	Bilateral independent foci.	Total.
Male	8	4	1	13
Female	4	0	1	5
Total	12	4	2	18

Analysis of sex and age in relationship to temporal laterality was unprofitable. Laterality in the five patients who had temporal foci in the feeble-minded and dementia groups was two on the right side and three on the left. There was no sex distinction.

In addition to the spike or sharp wave focus of the inter-seizure record, previously described, slow wave activity was also present. Its rate varied between

2–7 cycles per second, and although generalized it was maximal anteriorly in the frontal and anterior temporal regions. It often occurred for long periods in the record and was of moderate voltage. However, of interest was the fact that this disturbance was most obvious, and occurred most frequently on the side where the spike focus was found. This unilateral preponderance, apart from the focus, distinguishes clearly the cases in the behavioural automatism group from the other two groups, where similar slow waves occur but are more frequently symmetrical. So much is this so that it is felt to indicate strongly the possiblity of a focus, if this is not found on the recording.

Records of "psychomotor" seizures have been obtained, and confirm clearly the description of such an attack given by Hill (1949). One record shows clearly an apparently straightforward "psychomotor" attack suddenly passing over to a major seizure. Such a phenomenon may well account for the description of automatisms appearing to precede a major convulsion. A further record is of interest, in which a bilateral "psychomotor" seizure starts on one side, before becoming generalized. Initial suppression is clearly shown to occur on one side while normal rhythm continues unchanged on the other. During the period of unilateral discharge the head commenced to turn to the ipsilateral side, and this movement performed slowly and accompanied by nodding takes a minute to complete. This observation confirms that of Paillas and Subivana (1950). No records have been obtained in the psychotic episodes. In one case, however, in which automatic behaviour had been present for over thirty hours, a record was obtained which showed a continuous 5–6 cycles per second high voltage activity. This appears to be similar to the records obtained in "psychotic states" by Jasper (1941). In a resting record this case showed a well-marked focus in the left anterior temporal region.

Etiology of Automatism Group.

Known organic lesions were present in 8 patients (7 men and 1 woman) out of the 18 patients in the group. In 4 of these patients this pathology consisted of severe head injury prior to the onset of their fits, and in one of these cases a piece of shrapnel from the 1914–18 War was embedded in the anterior temporal lobe. In 3 cases (2 men and 1 woman) a cerebral tumour was present. The remaining case had had a temporal lobe abscess drained prior to the onset of his fits. In 4 of the cases the pathology was left-sided and accounted for the left temporal foci, and in the remaining 4 cases it was right-sided.

If "idiopathic" cases are considered, then it will be seen that 8 foci occur on the right side and none on the left, with 2 cases showing bilateral independent foci. However, in these last two cases the left focus, in each case, is by far the most prominent. The right anterior focus in each of these two cases occurs very infrequently.

Incidence of an Aura.

The history of an aura was obtained in 20 out of the total 47 epileptics in the hospital; of these 20 patients, 15 belonged to the epileptic automatism

group. Three of the remaining 5 patients who experience an aura prior to an attack were also found to have a temporal lobe focus in the E.E.G. In these cases the aura was a sensation of giddiness (2 cases) and a roaring noise (1 case.)

Thus it may be seen that 18 out of a total of 20 patients who have an aura have a temporal lobe focus.

Conclusions.

In this hospital population automatism occurs frequently among the epileptic patients. The observation of Jackson that the slighter the preceding fit the more purposeful the subsequent automatism is amply borne out by the present cases. Whenever an attack in entirety was accurately observed a fit always preceded the automatic behaviour, and it is felt that all automatism is probably post-epileptic in origin.

The association of automatism with a temporal lobe focus in the E.E.G. is confirmed. This temporal focus accounted for the E.E.G. abnormality in 50 per cent of the epileptic population, and is greater by far than the 1 in 5 patients with epilepsy found by Jasper *et al.* (1951). In addition, automatism occurred in 78 per cent. of the temporal lobe foci here, as compared with 46 per cent. of cases described by Jasper *et al.* (1952).

From this it would appear that temporal lobe epilepsy has a greater tendency to gravitate to a mental hospital than any other form. This is due to the poor response of these patients to drug therapy, and the antisocial behaviour that they exhibit subsequent to their attacks.

Further evidence of focal origin for the initial fits associated with automatism is afforded by the high incidence of an aura preceding the attacks. Indeed, as Jackson suggested, the aura frequently occurs on its own without any subsequent seizure.

Summary.

1. The history of temporal lobe epilepsy is reviewed.

2. The epileptic population of the hospital was investigated clinically and electro-encephalographically as a probable source of temporal lobe dysfunction.

3. A temporal lobe focus in the E.E.G. was found to occur in 50 per cent. of the epileptic population, and in 78 per cent. of patients was associated with clinical automatism.

4. Association of personality disturbances and automatism was noted.

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VISUAL AGNOSIA AND ALTERNATING DOMINANCE; ANALYSIS OF A CASE.

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The case here described is of interest in that it concerns a young man of good intelligence who presented a disorder limited to visual-gnostic functions; this is noteworthy as the majority of the cases described are elderly patients and there are usually other than visual gnostic functions involved. The case has special circumstances of additional significance. The patient had lost the sight of his right eye in infancy and he was a definite right-handed man; the damage involved the right hemisphere; this exceptional coincidence raises interesting problems of hemispheric dominance.

The patient, J. S. B—, 32 years of age, a civil engineer with Honours University degree, had a history of an endogenous depression going back a few months prior to his admission. He thought he had contracted tubercle, refused promotion offered to him, reproached himself that he had not made the most of his degrees and felt his career was finished. When admitted to hospital on 1.ii.52 he was in a depressed state, worrying about his condition and was somewhat agitated. He was very apprehensive about being put into a mental hospital and felt that he would have to stay in hospital for his lifetime. The morning after his admission he made in a sudden impulse a cut with his right hand into the right side of his neck. There was fairly heavy bleeding. He struggled with the nurses and doctors when attended to, and it was necessary to compress manually the right side of the neck for twenty minutes until the bleeding points were ligatured. The patient was carried to the theatre and the wound was inspected and sutured under general anaesthesia. There was no injury to the carotid artery nor to the internal jugular vein. He had two pints of blood transfused, and in the next two days he was kept under fairly heavy sedation with sodium amytal. His temperature showed a slight rise in the first few days but was normal later. The wound healed without complications.

It was possible to carry out an examination of the patient on the third day after the incident occurred. He was then still rather slow and hesitant in his answers. There were no aphasic symptoms. His memory seemed to be unimpaired; he could recollect all the details of what happened in recent weeks, and could remember his journey to hospital and his suicidal attempt. He could give a detailed history about his illness, and his information was essentially the same as that obtained from his relatives. Some stock phrases recurred in the earlier examinations.

When first examined it became apparent that the patient had some difficulties in vision. When an object was exposed he had to look for a long time before he could say what object it was, and he gave a wrong answer on various occasions. On confrontation test there seemed to be a loss of the temporal half of the visual field of the left eye. He himself stated later that he had for several days after his suicidal attempt the feeling as if he was blind, but any more detailed description of this condition could not be obtained from him.

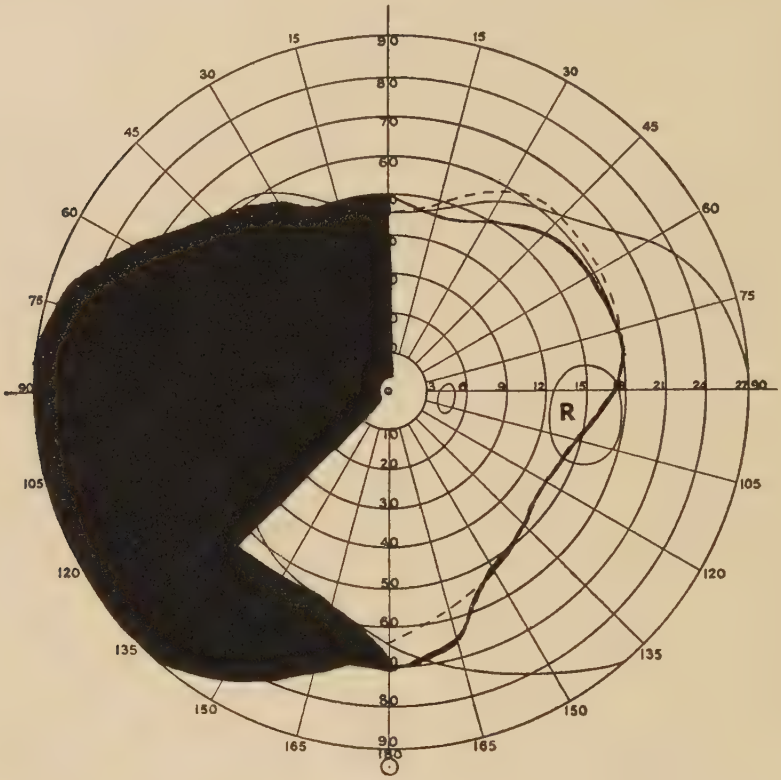

FIG. 1.

Detailed testing was carried out in numerous sessions and the following is a summary of the results.

On neurological examination there was a slight paresis of the left lower facial muscles. His visual field was checked on a number of occasions and showed in the left eye a temporal defect which was complete in the upper quadrant, a narrow medial sector being preserved in the lower quadrant (see Fig. 1). Macular vision was intact. He was unaware of his field defect. His visual acuity tested a week after his suicidal attempt was on the left $\frac{6}{9}$. There was a left-sided papilloedema. There were scattered white exudates all over the right fundus, perivascular sheathing and a complete atrophy of the disc; there was no vision in the right eye (Dr. Fraser). The lumbar puncture showed c.s.f. pressure of 200 mm. and 120 mgm. per cent. protein.

There was some retardation but the flow of *speech* was quite good when once started. For about a week he would repeat a number of phrases referring to his condition, which recurred frequently in various interviews. He could express himself well, and he had no difficulties in finding words either in conversational speech or in naming objects when he recognized them. His comprehension was perfect. From the beginning he could *read* fluently without any mistakes, and there were no mistakes in spontaneous *writing* or upon dictation. He had no difficulties with reading or writing of *numbers* ; he could pick out a number from a multitude distributed over a larger space. He was able to do *calculations* and arithmetical problems correctly though slowly. He was rather slow in his *thinking*, but he showed a good level in explaining differences, similarities and proverbs. His general knowledge corresponded to his educational level. His *memory* for past experience was good and there was no retention defect. There was no defect in *body orientation*. On only one occasion in the first week he mixed up right and left when asked to indicate a definite time on a watch he drew, but he never made mistakes in right-left of the body or outside space. His tactile recognition of objects was intact.

The functional loss was confined to the *visual gnostic field*, and involved at the beginning most of the functions connected with it. Some of these functions recovered in a comparatively short period whilst recovery in others was protracted.

Recognition of objects.—At the first examination the patient had difficulty in distinguishing some of the common objects around him. In subsequent days, lasting about a week, he showed some hesitation and a prolonged reaction time in recognition of objects which were not quite so familiar. He also could not identify various belongings, e.g., pen, comb, tooth-brush, bed and locker as his own.

Recognition of single pictorial objects:—He never recognized or named a pictorial object instantaneously. After a prolonged reaction time he finally recognized as a rule familiar pictorial objects; but he had great difficulty in distinguishing pictures of objects belonging to a common group; for instance, he called a cow a horse, a cat a squirrel, and a dog a small animal without being quite sure what kind of animal it was. He did not recognize a cupboard, although he could describe it in most of the details if not quite accurately. He had still some difficulty six weeks after the incident in recognizing the drawing of a cow; he described it as "a horse's body with a cow's udder, sort of half horse and half cow—may be it is not a horse. Yes, it is really a cow." The same picture was shown to him twelve days previously, and this might have influenced his reaction at the time. At the end of March, eight weeks after the incident, he had no more difficulties with single pictures.

Pictorial situations.—At the beginning the patient was quite unable to recognize even the simplest pictorial situation. This may be illustrated by the following comment he gave to the Terman picture of a man carrying an umbrella; "It is a figure and something half-moon shaped, a segment, a circle, a figure with something on his back, some sort of satchel, man with a saw upside down. I should know . . . it is a sort of sharp . . . he is holding a long shaped thing, a sort of heavy frame." To the Terman picture

of a white man fighting Indians he said : " A figure holding something in the hand like that, a bar with metal ; he is lifting something with the hand, a kind of excercise ; a figure there and a figure there." Later he said : "There is a man who is holding something but it doesn't convey anything to me at all. There is a bar along there. This figure is holding something, something with weights, a thing used for lifting." When further pressed he said : " A group of three figures. This figure is holding something in his hand : it could be a hammer." Finally he though it might be athletics—" sports people." Similar responses were obtained for about three to four weeks and then a gradual improvement took place. After this period his difficulties were mainly in pictorial situations of photogravure type such as pictures of Murray's Thematic Apperception Test. The following are his reactions to Picture 17 G.F. of the T.A.T. (Houses, boats on the river ; a woman on the bridge). He had some difficulty turning it into the right position. " It is a bit complicated ; it is a wheel ; that is the harbour and these are spokes of the wheel pointing to the sun." He now turned it into the correct position but was not happy about it and again turned it round. He now saw a house with windows, then after a time he saw a figure and thought that this figure was on a sort of ladder, then he corrected ; " It might not be a wheel ; it is the sun, the rays of the sun." He then saw another house and he summed up : " It is a morning scene, somebody setting off to work in the fields." After six weeks he had no difficulty in interpretation of such drawings as depicted in Terman tests but recognition was still very incomplete in the pictures of the Thematic Apperception Test and he was unable to grasp the situations in an adequate way. After about three and a half months he was able to give a satisfactory and detailed interpretation even of complex pictures.

After attending cinematographic performances during the first few weeks of his illness he could only give a very poor account of the action and stated that he was unable to follow the theme properly as everything was " muddled."

Spatial orientation.—From the beginning he could estimate correctly the absolute and relative distance of objects. There was severe disorientation in place ; when in the corridor leading to his room he did not know in which direction to go. He was unable to identify his own room—a small dormitory—and was unable to find his bed. When taken to his bed he was uncertain whether it was in fact his. He tried to confirm this from various possessions on his locker, but because of the difficulty in identifying his belongings he could not make up his mind. This very gross defect in orientation lasted for about a fortnight. After this his orientation improved, though he had some residual difficulties. He was still unable to make an adequate sketch of his dormitory, nor could he find his way back from the consulting room to his own room after he had made this journey every day for more than a fortnight. He was taken to Glasgow four weeks after the incident. He had been quite familiar with the city before his illness, but now he could not say, when in the centre of the city, where he was nor could he find his way to outstanding places or buildings. The orientation in space improved at about the same rate as the recognition of pictorial situations. But it took him still longer than usual to orient himself in new surroundings even at the time of his discharge.

Recognition of persons.—His relatives and previous friends did not come to see him in the first few weeks of his illness, but at the beginning he had great difficulty in recognizing nurses and doctors whom he saw frequently. He was also quite unable to describe adequately either the features or build of these persons. He regarded as very similar in their appearance persons who were in fact quite different. In describing persons whom he saw every day he would say that a thick-set, rather small man was tall and thin, and he made other similar mistakes. These difficulties in remembering and identifying persons receded at the same pace as the difficulties in recognition of pictorial situations and the spatial orientation.

Memory for recent visual experience.—Immediate retention of visual impressions of objects was reduced. When four geometrical figures were exposed for three seconds he recalled two of them and these only approximately. He had not lost the ability to store visual experiences, but he recalled much less material than one would have expected from him normally. His defective memory for persons and his difficulties with spatial orientation can also partly be ascribed to defective visual memory. He could describe from memory in some details familiar objects, animate and inanimate. One has, however, to remember that such descriptions can be made without visual imagery. He was, however, at a complete loss when incomplete pictures were presented to him ; they did not convey anything to him. Similar negative responses were obtained when he had to complete such drawings ; he was completely sterile in such completion tests. His best effort was to close by straight lines an incomplete figure presented to him. In contrast to this he produced very good responses after his recovery. The improvement in visual imagery more or less coincided with his improvement in drawing.

Drawing.—His profession required skilful drawing and he had never had any difficulties before. The following were characteristic of his drawings at the beginning of his illness : Copying and free drawing showed an undue haste as if he wanted to complete it as quickly as possible. He was at the same time careless ; he did not mind if the line was straight or not and he did not check up or make corrections. His drawings were altogether very sketchy and disorderly. No similar reactions were observed in writing or other performances.. In copying pictorial objects he did not keep to the original but drew his own pattern which was not precise and left out some details. When copying animal pictures he sometimes left out distinguishing features (e.g., udder of a cow). He could draw familiar objects from memory but the style of his drawing was very simple. Thus he would draw a man's limbs in simple straight lines, whilst later when his symptoms had disappeared he presented a skilful and elaborate drawing (see Figs. 2A and 2B). His drawing of animals was particularly revealing. There was little differentiation in his drawings of similar species ; e.g., a dog looked more like a cow. He could copy correctly geometrical figures of any complexity, including Abelson figures. He could draw the map of Great Britain quite well and insert the principal towns in the right places. The drawing of a map of Africa, however was only approximate. He recovered what might be regarded as his previous skill in drawing after about three to four months.

Colour agnosia.—Before his present illness he had no difficulties with colours. In his occupation as a civil engineer he regularly made coloured drawings and never made any mistakes in choosing the correct colour.

The following tests on *colour vision* were carried out: the various tests on Holmgren skeins, naming the colours of coloured objects shown to him,

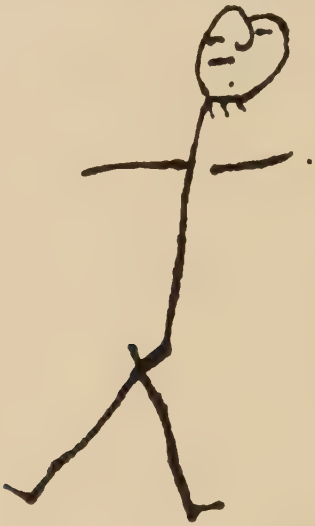

FIG. 2A. A week after the brain injury.

FIG. 2B. Four months after the brain injury.

naming the colours of objects with standardized colours from memory, naming of various objects of a particular colour, copying of coloured drawings, copying of a band of colours, picking out colours from a multicoloured object, Ishihara test, and colorimetric testing.

In the *first four weeks* he was unable to do any systematic sorting on the Holmgren's skeins ; he found everything "in a tangle." He would sort out a few reds, and then he might add a blue or a bright brownish colour to it. He could not separate the various assortments he had made and thus became completely mixed up. He had equal difficulties with all colours. In naming of single colours or comparing two colours and in any of the other tests mentioned he was never quite certain, and wrong answers were more often than right ones. When deciding on a colour at this time he would look for a long time at the exposed skein, would often complain about the poor light ; although it was bright daylight, he would often rub his eyes as if he could not see the colours properly and in the end he was never certain about the result. He admitted on various occasions that he had been guessing. He could only read the first figure in the Ishihara test at this period.

There followed a slow, gradual improvement ; after eight weeks there was more order in the sorting of skeins, though there were mistakes with all the colours and particularly with blue and green. Colorimetric testing at this time (Dr. Pickford) showed a marked defect in red which classed him as red anomalous without darkening of the red, and a slight weakness in yellow. The finding was considered consistent with a moderate deuteranopia with the exception of the weakness in yellow, which could have been an independent minor defect.

In the period following this examination the colour distinction made further progress ; he was able to sort out correctly, with some regularity and confidence, yellow and next red, but he was still uncertain about green and blue which were frequently confused. After three months he usually separated the primary colours in the sorting test and named them correctly when presented singly, but he made numerous mistakes with mixed colours. In particular he had difficulty in distinguishing brownish colours from red and dark colours from black. He still looked at each skein very carefully before he made his choice. He consistently made more mistakes in the copying of multicoloured drawings and of colour bands than in other tests. At this period the results still varied greatly in the various sessions, particularly in the sorting test.

There was also a gradual improvement in the Ishihara test and the number of correct results increased. The mistakes, however, were fairly equally distributed over all the plates and did not seem to indicate any specific anomaly. On 9.x.52, seven months after the damage had occurred, he was again tested by Dr. Pickford, and he showed a marked improvement on both the colorimetric test and on Ishihara as compared with his performance five months previously. There was only slight weakness in red and a very small weakness in the direction of blue colorimetrically, whilst yellow, which was weak before, was now normal. He now made eight mistakes on Ishihara in twenty-five plates ; this is within normal limits. There was, therefore, in this examination not enough evidence for regarding him as a red anomalous or moderate deuteranope : *his colour vision* had to be regarded as *within normal limits.*

When last tested at the beginning of November, 1952, he still made some mistakes on the sorting of Holmgren wools; he placed the brownish colours occasionally to red and had some difficulty in distinguishing dark colours from black. Moreover, in copying coloured pictures or coloured series he had difficulties in choosing the correct shades.

The visual fields were checked regularly, and when last tested at the beginning of November they remained unchanged. At that time he still had complete loss of the temporal upper quadrant and the defect of the lower quadrant was the same as at the beginning of his illness. The degree of papilloedema of the left eye was unchanged. The visual acuity had remained at $\frac{6}{9}$. Lumbar puncture, performed a few days before the patient's discharge showed c.s.f. pressure of 120 mm. and 60 mg. per cent. protein.

The patient did not complain of any physical symptoms, and in particular he never had any headaches. He remained deeply depressed two months after his admission. It was then decided to give him a course of E.C.T.; he gradually improved from then onwards and at the time of his discharge he was quite well.

Summary of the Case.

An engineer of good intelligence, 32 years of age, attempted suicide by cutting the right side of his neck whilst in a depressive state. He was right-handed and had been blind in his right eye since infancy. Manual compression of the neck was necessary for about twenty minutes before the bleeding vessels could be ligatured. He developed a temporal visual field defect of the left eye after this incident. He had a slight agnosia for concrete objects, a more marked agnosia for pictorial objects and a still more severe one for pictorial situations and for persons. He had a severe disorientation in place and a colour disturbance. There was a gradual restitution of all these functions except for the field defect. The length of time it took the various functions to recover corresponded to the initial severity of the disturbance. The colour disturbance was the last to recover, and there were still signs of weakness in colour differentiation when the patient was last tested about nine months after the injury. From the beginning the patient had a slight oedema of the left active eye. He had a visual acuity of $\frac{6}{9}$ from the start of his cerebral symptomatology.

Discussion.

Three main groups of *agnosic disorders* were present in our case, namely *object agnosia*, *spatial agnosia* and *colour agnosia*. As they are all closely connected with the visual system they are frequently found simultaneously, though they may occur independently of each other.

A distinction has been made between agnosia for concrete objects, pictorial objects, pictorial situations and for persons. In the great majority of cases the agnosia for concrete objects is least and that for pictorial situations most involved. This is also true for our case, where in the later stage of the restitution the agnosia for pictorial situations alone persisted. It seems, therefore, that the intensity of the disturbance increased with the complexity of the

visual object. It has, however, been suggested that the agnosia for pictorial situations is a separate entity due to a special defect, the inability to perceive a pictorial scene simultaneously (simultaneous agnosia, Wolpert, 1924). The disturbance in our case which was marked for single pictorial objects was more severe for pictorial situations drawn in contours, and still more so for the photogravure type of pictorial situation. His reaction time for recognition of pictorial objects was prolonged; he occasionally mixed up details, and his description was often incomplete. He usually recognized familiar pictorial objects that had well-defined and characteristic general shape, but he misidentified objects which, belonging to a common group, are only distinguished by details; he was accordingly particularly poor in animal pictures.

In pictorial situations drawn in contours more details were missed, and objects which he was able to recognize singly were not identified in the situational context. In photogravures a long exposure time was needed before definite shapes emerged. He was unable to obtain an immediate general impression and proceeded gradually from part to part. The parts were incompletely perceived, details were missed, and when he finally integrated the partial impressions into a whole his interpretation was inaccurate and inadequate. His difficulty in the recognition of single pictorial objects became therefore more marked when the pictorial object was less representative and when more details were needed for differentiation. In pictorial situations, more so in photogravures than in contour drawings, the single objects lose some of their representative character, as by additional features the parts are related to each other and to the whole and so more details have to be registered. Correspondingly, the difficulties of our patient increased. His specific defects were thus particularly exposed by the special conditions in pictorial situations and more so in drawings of photogravure type. There is, therefore, no reason in our case to make a *separate factor responsible for the predominance of agnosia for pictorial situations.*

The manner in which our patient responded to pictorial objects, particularly to photogravures, suggests a defect in visual perception which can best be illustrated in terms of Gestalt principles. A pictorial situation was for our patient first an unorganized mass from which the figure was sorted out from the background only gradually, and such figures as were formed lacked precision and completeness. But the perceptive defect alone cannot explain all the reactions of our patient. On occasions he was unable to identify a pictorial object even when able to describe all the details; his perception was thus adequate and the Gestalt well structured, but the necessary associations failed to emerge. Since Lissauer (1890) postulated theoretically a perceptive and an associative form, these two forms of agnosia have found special consideration in the literature of agnosia. Some cases were claimed to present pure examples of one or the other of these forms (Goldstein, 1923; Brain, 1941; Adler, 1944), but in most cases both the perceptive and associative factor seemed to have been involved. Copying is one of the ways to decide whether there is an associative or perceptive form present. In associative disturbance with intact perception the copying is correct, whilst in a perceptive disturbance the patients are unable to copy.

In our patient the copying as well as the free drawing was altered. He drew in a sketchy and ca[illegible] way. His drawing was inaccurate and simple. A pattern once adopted reappeared in successive drawings. He never kept to the original drawing when copying. There was, therefore, in his performance in drawing not much evidence for either perceptive or associative defect. It indicated rather a *vagueness of his visual imagery*, the imagery being simplified and lacking in distinctiveness. The undue speed of his drawing pointed moreover to some difficulty in retaining a visual image. The poverty of his visual imagery became still more manifest in completion tests. Neither visually nor by drawing was he able to complete even the simplest patterns.

The agnosic disturbances for persons and the disorientation for places do not require a separate analysis. Factors mentioned previously are sufficient to explain his difficulties: the failure of perceiving details, his difficulty in shifting the visual attention and the defects in visual imagery may have been the main factors for these disturbances.

The most outstanding features of the object agnosia in our cases were thus *perceptive and associative defects* and *defects in visual imagery*. But there was also a reduced retention of visual perception, a perseveration of visual experiences and inability to shift the focus of visual attention and to reorganize visual impressions. Thus the defect involved numerous factors essential for visual function at a higher level; a process which before proceeded automatically had become a laborious, fragmented procedure. Perceptive and associative difficulties were thus only part of a *general disintegration*, and it would be of no particular value to weigh up one against the other. Nor can the disturbance in figure ground formation be regarded as the key to the disorder, although the mode of the altered perceptive procedure can best be demonstrated in terms of the Gestalt principle.

Some discussion has arisen about the *significance of peripheral defects* in visual agnosia. This peripheral factor has been particularly stressed by Poppelreuter (1923), Beringer and Stein (1930) and Stein and Buërger-Prinz (1932). More recently Bay and Lauenstein (1947) found in an analysis of a number of cases in the literature and from observations of their own that in all these cases peripheral defects were present which were severe enough to explain the agnosia; they come to the conclusion that a visual agnosia as described in the literature does not exist. Although this extreme view is not justified it is true that in a number of reported cases peripheral factors did not get the consideration they deserve. In our case the visual acuity was from the beginning good, and in contrast to other visual functions the perfect reading of ordinary print leaves no doubt about his satisfactory visual acuity. There is in this case, therefore, no doubt about the central origin of the defects.

Colour disturbance.—Three types of colour defects of cerebral origin can be distinguished; cortical colour blindness, colour agnosia and amnesia for colour names. In cortical colour blindness the colour sense is lost. In the cases described (Wilbrandt, 1892; Poetzl, 1928 *et al.*) the patients saw everything grey or could only distinguish between white and black, and in Wilbrandt's case there was a residual red-green blindness. In colour agnosia the patients are unable to identify and sort out particular colours whilst their colour vision as

tested by colorimetric methods is intact. In amnesia for colour names the colour vision is intact as well, and the predomina difficulties are not those of colour identification but of naming the right colours.

Our own case showed when tested colorimetrically defects from which he later recovered. This suggests that there was initially a *cortical colour blindness* present. However, at the time when he had colorimetrically only a weakness in red and a slight weakness in yellow, on sorting and similar tests all the colours were more or less equally and fairly severely involved, and at the time when he was colorimetrically considered normal he still showed difficulties in sorting of some colours. This suggests that there was superimposed upon a cortical colour blindness a *colour defect of agnosic type*, and this is also indicated by his defect in colour imagery.

Although there is a clear distinction between cortical colour blindness and colour agnosia by definition, various reactions of patients with colour agnosia seem to suggest that there is a defect in perception as well, Their responses are indeed in many ways similar to those found in colour blindness. They may often match colours according to brightness instead of hue, they frequently have difficulties with the differentiation of green and blue similar to trichromatic anomalies (Poetzl, 1928; Stengel, 1944 *et al.*). Many patients with colour agnosia state that they see the colours different from what they appeared to them before their illness. The difference in the conditions between colorimetric testing and testing on Holmgren skeins has been pointed out in order to explain why the patients fail in one and not in the other (Sittig, 1921): in the colorimetric test only the equality and difference of two colours have to be decided, whereas sorting and other related tests are more complicated; in the sorting tests the surroundings might interfere with recognition by the effects of contrast (Poetzl). However difficult it may be to explain these reactions, they are not a strong argument in favour of a perceptive theory; it has to be kept in mind that even slight deviations from the normal are being revealed colorimetrically. One can, therefore, hardly believe in a perceptive disturbance in colour agnosia when the colorimetric testing is so regularly found normal.

Colour recognition is a much more elementary process than recognition of objects, and investigation reveals little material to show that there is a disturbance at a higher level; but one factor present in all the observations is a defect in colour imagery. This applies to amnesia for colour names as well as for colour agnosia. In the material collected from the literature by Sittig there is only one case in which the colour imagery was not severely involved. It is significant that most of these patients are unable to find colours from memory of familiar objects with standard colours in spite of the strong association between colour names and names of objects (e.g., sky—blue, blood—red); the defect in colour imagery was also evident in our case, though only by an occasional slip. Colour imagery is like any other imagery based on past experience, and as such will have some part to play in colour recognition. Under some conditions more than others we have to refer to a standard colour, and have to go back to our colour imagery as a source of reference. Such reference will for obvious reasons not be necessary in the Ishihara test, nor will it be necessary

in the colorimetric testing where only equality and difference has to be decided. The same is largely true when two skeins have to be compared as to difference and equality as long as no conceptual procedure is involved. There is accordingly in colour agnosia no disturbance in the Ishihara or in colorimetric tests, and there are usually no great difficulties when skeins are compared as to difference and equality.

On the other hand, it will usually be necessary to refer to a standard colour by means of colour imagery in colour naming, selecting colours, and particularly in sorting of colours. Accordingly these are the tests in which the colour agnosias particularly fail. Finally there is the complaint of some patients of seeing the colours as different from before ; since the colour imagery is absent or vague and there is no standard to refer to, the colour may appear unfamiliar and strange. Thus the main traits in colour agnosia can be explained by lack of colour imagery, and there does not seem to be any need to assume a perceptive disturbance for which there is no evidence.

A separate problem in our case is that of dominance. Our observation is an instructive and unique example of certain aspects of this problem. Handedness has been generally accepted as indicating the side of hemispheric dominance as far as higher cortical functions are concerned. It is well known that a person's laterality of dominance of eye, hand and foot may alternate. There is, however, no pathological material available which could give information about the distribution of dominance between the two hemispheres in cases where the laterality of dominance in the peripheral organs alternates—a question which is of some clinical importance. Our case demonstrates this relationship very clearly. There is no doubt about the laterality of dominance of eye and hand. He was definitely right-handed, and he had lost the sight of his right eye in infancy. The brain damage, as indicated by the visual field defect of his left eye, involved the *right hemisphere* and caused a clinical picture of *visual agnosia disturbances*. Such disturbances arise only in occipital lesions of the dominant hemisphere, and it can therefore be concluded that, in accordance with his monocularity, *the right occipital lobe* was in our case *dominant for higher visual functions*.

Acalculia and an amnesic aphasia is as a rule associated with visual agnosia ; amnesic aphasia is particularly closely connected with colour agnosia. Word-blindness is almost regularly involved in visual agnosia apart from combining with colour agnosia. All these symptoms were from the beginning absent in our case. This suggests, as indicated by his right-handedness, that functions other than visual seem to have been dominated by the intact left hemisphere.

The absence of word blindness is of special interest. Reading is, as distinct from other visual functions, a function of language as well as a visual-gnostic function. Alexia is as regularly associated with aphasia as with agnosia, though different in type in the two conditions. In the period when the reading was being acquired by our patient the dominance of the right hemisphere for higher visual functions and that of the left hemisphere for speech had already been established. It was, therefore, the laterality for speech which prevailed and determined the laterality for reading. Reading is only one of many composite

faculties built up on more than one fundamental function. A similar split may arise for a number of composite functions in alternating dominance of this kind. The complexity arising from alternating hemispheric dominance and such functional interrelations might well account for some of the variations in the clinical symptomatology in cases where the presence or absence of symptoms is difficult to explain on anatomical grounds. It might also give some explanation for the shift of dominance of certain functions mentioned in the literature.

The *brain damage* in our case followed a cut of the right side of the neck without injury to the big arteries or veins. The complication apparently arose when the injured part was heavily compressed for a considerable period. Following this there appeared signs of intracranial pressure apart from the focal symptoms. The lumbar puncture showed increase in protein and raised pressure of the c.s.f. and there was an oedema of the disc. On subsequent controls the pressure of the c.s.f. and the protein gradually returned to normal, but the swelling of the disc still persisted during the observation period of nine months. Considering the restitution of the focal symptoms and the disappearance of the pathological signs in the c.s.f. a neoplastic process which might have coincidentally developed can be excluded. There were no signs indicating a rupture of a congenital aneurysm. It seems most likely that simultaneously with the compression of the neck the internal jugular vein was compressed. Although ligation of the jugular vein has, as a rule, no consequences, there are cases in which damage occurs and it seems that our case belongs to this group.

Summary.

A right-handed, intelligent man, 32 years of age, was blind in the right eye since infancy. In a state of depression he attempted suicide by cutting the right side of his throat. It was necessary to compress the neck manually before sutures were inserted. Following this he had symptoms of increased intracranial pressure, and focal signs which consisted of a temporal field defect of his left eye and a temporary visual agnosia and cortical colour-blindness combined with colour agnosia. The brain damage was probably due to thrombosis of the venous system of the right occipital lobe. The agnosia symptoms have been studied during the restitutional phase and their character analysed and described. Noteworthy was the absence of symptoms which are usually associated with visual agnosia, particularly the absence of word-blindness. This could be explained by the presence of alternating dominance. It has been found that the visual functions in this case were dominated by the right hemisphere and other higher functions by the left hemisphere. The significance of such alternating dominance has been discussed.

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THE USE OF FINGERPAINTINGS IN THE CLINICAL EVALUATION OF PSYCHOTIC CONDITIONS: A QUANTITATIVE AND QUALITATIVE APPROACH.*

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Paintings and drawings of emotionally and mentally disturbed persons have been the subject of many psychological and psychiatric investigations. The psychological evaluation of graphic art can probably be considered as the oldest "projective" technique. Paintings and drawings have been systematically studied by psychologists and psychiatrists from three different aspects:

1, As indicators of the developmental stage reached in perceptual, motor and intellectual functions (Goodenough, 1926; Graewe, 1932; Bender, 1938; Gesell and Ames, 1946).

2. As symptomatic manifestations of mental disturbances (Hrdlicka, 1899; Mohr, 1906–07; Prinzhorn, 1923; Morgenthaler, 1922; Engerth, 1933; Guttmann and Maclay, 1937).

3. As symbolic representations of psychodynamic constellations (Rorschach, 1913; Lewis, 1925; Naúmberg, 1945; Alschuler and Hattwick, 1947; Bell, 1948; Machover, 1949).

The vast literature on this subject covering the publications until 1941 has been thoroughly reviewed by Anastasi and Foley (1940, 1941) with regard to the artistic productions of the abnormal. The literature on children's drawings is comprehensively covered up to 1950 in two reviews, the first by Goodenough (1928), the second by Goodenough and Harris (1950).

It is the intention of this report to describe a method of clinical evaluation of a disturbed person's mental condition through the study of his free graphic expression in the form of fingerpainting. Although a number of investigations have been published in this particular field of application (Shaw, 1938; Fleming, 1940; Mosse, 1940; Rosenzweig and Durbin, 1945; Aslow and Kadis, 1946; Napoli, 1946 and 1947; Blum and Dragositz, 1947; Phillips and Stromberg, 1948), their practical value for clinical purposes has been limited by a number

* The National Film Board of Canada has produced a film strip on the evaluation of fingerpaintings in psychiatric conditions. This film strip contains 37 reproductions in colour of fingerpaintings from our material, illustrating the four principal rating categories and the changes that occur in the fingerpaintings of psychiatric patients under treatment.

of factors. In order to be really useful and practical for the clinician, such a method should fulfil the following requirements :

1. The method should be applicable to any patient regardless of his degree of artistic ability, interest, co-operation and intelligence.

2. It should be possible to obtain repeated productions which are comparable in order to obtain a longitudinal view of the variations in the patient's graphic expression over a period of time.

3. The method should allow for the comparison of productions of different patients and of the same patient at different times by means of a standardized method of rating.

4. It should be possible to obtain useful and valid information on the patient's mental condition through the evaluation of his paintings without having to spend additional time in observing the patient while he is painting or in interviewing him about his finished product.

In addition it seems advisable to use as simple and direct a method of painting as possible in order to reduce to a minimum the technical difficulties connected with the handling of the various media in the making of the painting.

For this reason, we have relied entirely on fingerpainting, since it is the most direct and most primitive form of graphic expression. Some of the earliest paintings known in the history of man, for instance, the paintings on the walls of the cave at Altamira, Spain, were fingerpaintings, and every artist will at times rely on his fingers rather than on any other instrument for the achievement of a certain effect. Shaw (1938) developed the method of fingerpainting originally for the specific purpose of providing children with an easily available outlet for the expression of fantasies without being hampered by the restrictions imposed upon them by difficult requirements of technique and motor skills. Blum and Dragositz (1947) point out that there were few developmental differences noticed in fingerpaintings produced by children of the first grade and of the sixth grade. This is a rather remarkable finding in view of the very pronounced differences that would be expected to appear in any other form of graphic expression at these different developmental stages. Fingerpainting, because of its simple and primitive approach and because of the unfamiliarity that most subjects have with this method at the beginning, seems to reduce those differences in performance that are due to cultural factors, learning and development. We agree with Goodenough and Harris (1950), however, when they state their opinion that the search for an entirely culture-free test of any measurable trait is illusory.

An important consideration when one is making use of paintings for psychiatric purposes concerns the degree of objectivity that can be attained by the clinical evaluator. A bias may creep in because the clinician cannot divorce himself from the aesthetic impact which the artistic production has made upon him. He may be delighted or disgusted by certain paintings and his psychiatric judgement may consequently be clouded. Another important bias often arises from the clinician's special dynamic orientation, which may lead him far afield in elaborate interpretation of every single feature of the patient's graphic product. While such interpretations may be, and indeed are, often highly ingenious and revealing, they may also be highly

erroneous. It is our opinion that no detailed interpretation of a painting or drawing should be accepted as valid unless it is the result of careful analytic work with a patient who is directed to deal with his artistic production as though it were a dream or a fantasy.

We have, therefore, attempted to devise a method of evaluation which would give the greatest possible protection against the aesthetic and the interpretative bias. Consequently, emphasis has been chiefly on the formal aspects of the graphic productions. This also offers the advantage of lending itself more easily to a rating system which allows for quantitative scores.

Finally, it seemed desirable to choose descriptive categories of graphic expression which are also significant for the description of behavioural aspects of the patient who produced the painting. Otherwise, problems arise when one attempts to translate the results of the test evaluation into meaningful psychiatric language. Such difficulties are encountered, for instance, with the Rorschach test and its scoring categories or determinants which are not always easily interpreted in clinical terms.

Several other methods for the quantitative evaluation of drawings have been proposed, notably by Elkisch (1945), Waehner (1946) and Buck (1948). We feel, however, that their scoring systems are not always easily applied, since there is often doubt about the objective evaluation of such criteria as compression, rhythm, symmetry, integration, etc. Waehner, as well as Buck, score drawings of subjects who were given a definite task, such as drawing human faces or a house, a tree and a person, and their scoring system has not been validated on undirected graphic material.

Rationale of the Scoring Categories.

The following four categories have been chosen for our clinical evaluation of the patient's fingerpaintings:

1. Energy output.
2. Contact with reality.
3. Affective range.
4. Clarity.

The degree of energy output in a fingerpainting is determined by a number of factors, the most important ones being the number of strokes, the pressure used, and the surface covered. Also to be considered are the complexity of the design, the care exercised, etc. It has been assumed that the degree of energy output as it appears in the fingerpainting corresponds to the energy output which the patient manifests in his general behaviour. A painting, after all, is a permanent record of an individual's psychomotor activity at a given time.

Contact with reality is measured by the degree of realism which the subject has achieved in his painting or has at least obviously attempted to achieve. Again, it has been assumed that the contact with reality which an individual expresses in a freely chosen graphic production is representative of this individual's general relation to reality at the time he was painting. A number

of authors have commented on the unrealistic quality of the art productions of psychotic individuals. Mohr (1940) draws attention to the strange and unusual features in their drawings and notes that they become more realistic as the patient's mental condition improves. Cameron (1938) finds that the drawings of schizophrenics resemble the drawings of children, because neither children nor schizophrenics are motivated in their expression by the purpose of social communication. Hartenstein (1934) observed a sex difference in the realism of artistic representation: in her material, boys were twice as likely as girls to draw objects actually seen in their environment. It is, of course, quite within the range of normality to produce paintings that are abstract, non-objective, or, in some other way, unrealistic. If such paintings, however, are produced persistently over a period of weeks and months, it expresses at least one aspect of the subject's attitude to reality. Maclay, Guttmann and Mayer-Gross (1938) analysed the doodlings of non-psychotic persons, and found that these drawings which were produced during a temporary "lowering of the conscious level" were characterized by the prevalence of non-realistic patterns and designs.

The determination of the affective range of the person responsible for the painting is based on the findings of a number of investigators. We have proceeded with the thesis that the use of bright and "warm" colours such as red, orange and yellow reflects an outgoing free, sometimes impulsive, sometimes euphoric emotional setting, while blue and green, the neutral or "cold" colours, are indicative of more restrained emotions, and black, grey, purple and dark brown, the "sombre" colours, are expressive of a gloomy, depressed mood. Such a simplified approach to the highly complex problem of emotional expression is, of course, open to a great deal of controversy. For practical purposes, however, this formula has worked, and it has stood the test of clinical application. The experience gained with the Rorschach test is highly suggestive for the evaluation of the role which colour plays in painting and drawing. Although one is not necessarily justified in assuming that the colour/affect relationship which prevails in perception may be transferred to the individual's active choice and use of colour in manual production, it is difficult to see how one can entirely escape such a conclusion.

Alschuler and Hattwick (1947), in a thorough statistical study of the painting behaviour of 2–5-year-old children, state that the group of children emphasizing warm (red, orange, yellow) colours tended to show warmer, more affectionate relationships with others and a more emotionally toned behaviour, while children who emphasized cold colours (blue and green) tended to show more controlled, reasoned and less sympathetic behaviour. Other children who, over a period of time, consistently used black, tended, as a group to show a dearth of emotional behaviour. Staples (1932) found that the strongest interest in yellow was during infancy and that with increasing age there was more interest in blue. Schmidl-Waehner (1942) reports in a study of school age children that most of the neurotic depressives use mixtures of colours, black and blue. Traube (1937) noted that brown and violet were colours indicative of depression in a group of children. In a test situation, von Allesch (1925) asked experimental subjects to get the prescribed effect of "cheerful-

ness" from a colour stimulus. The task was easy with red, orange and saturated blue, but it was more difficult with dark blue and a blue that approached black. Katz (1931) found that psychotics preferred green and blue, while yellow, orange and red were preferred by the more chronic patients. In his material, men had a greater tendency to choose green and women to choose red. Pfister (1934) states that in psychotic patients the use of colour in their drawings reflects affective responsiveness. Mosse (1942) observes that red is the colour of choice of the manic and hypomanic patient, while melancholia and depression are revealed through a "blackout." We have found that green is the colour preferred by the majority of our patients, and the supply of green fingerpaint has to be considerably larger than that of the other colours. This may, as Robertson (1952) has pointed out, be due to the fact that many patients paint landscapes where green prevails.

Robertson (1952) has recently published a statistical study on the use of colour in the paintings of psychotics. He established that seriously disordered patients tended to prefer colours of the blue-red series and that they displayed "a weaker feeling in relation to colour." He reported that seriously disturbed patients employed heavy colouring more often and more frequently expressed a liking for unrealistic colourings. Unfortunately, his patient material was divided only with regard to the presence or absence of schizophrenic disorder and to the degree of chronicity of their psychosis. His findings, therefore, contribute little to the evaluation of the possible role colours are playing in the expression of various affective states.

Clarity in our rating scale is judged by the clearness of design, the neatness of execution, the distinctness of line and the separation of colours. Here are also considered the presence or absence of rhythm and co-ordination in the strokes and the degree of organization attempted and achieved. It is the clarity of a fingerpainting which is one of the most reliable indicators of a psychiatric patient's improvement. Paintings which lack clarity usually reflect some degree of intellectual or emotional confusion. Alschuler and Hattwick (1947) report that those children who produce "dirty" easel paintings as compared with those who produced clean paintings tended, as a group, to show uncontrolled, socially immature reactions which they considered to be relatively typical of the very young nursery-school child. In our material, increased clarity of the fingerpaintings would invariably relate to increased control of behaviour, thinking and emotional expression.

One peculiar effect was noted in the productions of many patients with paranoid symptoms and appeared only rarely in the paintings of other patients. It consists in a certain haze, a misty appearance which creates the impression that one is looking through smoke or a thin layer of fog. We have termed this particular effect "paranoid haze," because in the paintings of mentally disturbed individuals it is so characteristic of the presence of paranoid symptoms. It is often striking to witness the disappearance of this haze in the paintings of patients who recover and lose their paranoid syndrome. We feel that this haze effect is due to a basic disturbance of the figure-background relationship which may be one of the fundamental disturbances in the phenomenology of the paranoid syndrome.

Method and Material.

Our method of evaluation is based on clinical experience with 942 hospitalized psychotic patients who have produced close on 6,000 paintings since this study was begun in 1947. These paintings have been collected, dated, and filed under a cross-index system which allows for immediate reference under the patient's name as well as under his diagnostic entity. Most newly admitted patients are asked to fingerpaint during the first week of hospitalization and many are requested to produce further fingerpaintings at intervals from one week to one month, in some cases covering a period of several years. Anything the patient produces is considered and kept as a record, even if there is only a dot or a smear on the paper. If the patient refuses to paint, the blank page is dated and filed. We have come to the conclusion that an evaluation of serial productions can give valuable information on a patient's progress or failure to progress with therapy. Fingerpaintings, if used in the longitudinal view, are sensitive indicators of the patient's mental state. We are also convinced that interpretations of single paintings do not afford a solid basis for clinical diagnosis.

Our technical procedure of obtaining fingerpaintings is simple: The size of our paper is 12 in. by 18 in. Patients paint in groups of from five to ten patients at a time. They are provided with paint of six different colours: red, yellow, blue, green, brown and black. The paper is given to them wet, or dry if they prefer, and from then on they are given no further instructions or suggestions other than to make a painting by applying the paint with their fingers. An observer is present, usually an occupational therapist or a nurse, who notes any remarkable behaviour on the part of the patients. If the patients make any spontaneous comments on their painting, these are recorded in writing. Occasionally the observer will make inquiries. The observer remains as passive as possible, since any premature comment may have disastrous effects on the patient's productions, which can be destroyed, literally, by a wave of the hand. Patients are allowed as much time as they want to complete their painting. After the paintings have dried, they can be stored and kept almost indefinitely.

A certain practice effect is usually observed in non-psychotic subjects. After they have done a number of fingerpaintings and have become familiar with the medium, they tend to experiment with it and often will produce more "artistic" paintings in which the effects are achieved by creating designs in a uniform background of paint rather than using the paint to produce the design on a white background. Psychotic patients, however, improve their fingerpaintings only rarely with practice unless there is a parallel improvement in their mental condition. It is usually possible to demonstrate fluctuations of mood, energy output, etc., corresponding to the person's state of mind even in those non-psychotic individuals who have practice and skill with fingerpainting.

System of Scoring.

We have adopted a rating scale of 12 for each of the four previously discussed aspects of a fingerpainting. The most objective rating is possible for

the aspect of affective range. Here the following scores are given to the different colours: Red, Yellow: 3 each. Blue, Green: 2 each. Black, Brown: 1 each. As can be seen readily, this adds up to a maximum score of 12 if all six colours are used in painting. If only black were used the score would be 1. If green and yellow were employed the score would be 5, and so on.

The aspect of clarity is also given a rating from 1–12 according to the following guide:

Smearing and confusion	1–3
Careless; hazy	4–5
Fairly distinct to distinct	6–8
Highly accurate	9–10
Meticulous	11–12

The aspect of reality contact is rated as follows:

Indefinable, bizarre and meaningless repetition	1–3
Lettering; Symbolism; Abstract design	4–7
Landscape; buildings; people	8–10
Detailed representations of objects, plants, etc.	11–12

The aspect of energy output is rated as follows:

Daubing, dotting, thin lines, using quarter of the available space	1–4
Co-ordinated and continuous strokes of normal pressure using at least half of available space and showing some variety of design	5–8
Strong pressure scratching and tearing of the paper, thick overlay of paint, all or at least three quarters of the available space used	9–12

These rating scales are arranged so that a score of 8 represents approximately the optimal rating. Scores below or above it are considered as deviations from the ideal norm. We found that this empirical rating scale can be applied by different judges who, after a modest amount of practice will arrive independently at fairly close scores. It is to be noted that in a series of paintings produced over a certain period of time, the patient sets his own baseline and acts as his own control. Even if there is some difficulty in arriving at an absolute score in certain cases, there is almost never any problem to decide in which formal categories of the paintings a change has occurred and in which direction.

Statistical Data on Sample Groups.

In order to test our hypothesis that the four categories, "energy output," "contact with reality," "affective range," and "clarity," as rated in the paintings, actually relate to the painter's overt behaviour and clinical manifestations which may be described in the same terms, we have made a statistical analysis of five sample groups. Each group consisted of 30 paintings which

represent the first fingerpainting done by the 30 experimental subjects. Group I was produced by non-psychotic, healthy individuals, the "normal" group. Group II was made up of paintings done by manic-depressive patients in the manic or hypomanic phase. Group III consisted of paintings by manic-depressive patients in the depressed phase. Group IV was composed of paintings by patients suffering from schizophrenia of varying degrees of chronicity and deterioration and comprising the four clinical types of schizophrenia. Group V consisted of paintings by patients suffering from psychoses caused by organic brain disease. In this group there were patients with the diagnosis of dementia paralytica, senile dementia, cerebral arteriosclerosis, Alzheimer's disease and Parkinsonism. Each group was about equally divided with regard to sex and fairly well matched with regard to age, with the exception of the organic group, which had a higher mean age than the four other groups.

Table I gives the average scores and the standard deviations of each of the four categories in the five sample groups. It can be seen that the non-psychotics

TABLE I.—*Mean Scores and Standard Deviations of the Four Categories in Five Diagnostic Groups* ($N = 30$).

Diagnostic group.		Energy output.	Contact with reality.	Affective range.	Clarity.
Non-Psychotic	Mean	8·4	7·0	9·0	7·3
	Standard deviation	1·81	2·93	2·23	1·81
Manic	Mean	8·2	4·8	8·0	6·0
	Standard deviation	2·49	3·07	3·20	2·19
Schizophrenic	Mean	6·3	3·9	6·4	5·2
	Standard deviation	2·53	3·26	2·81	2·70
Depressed	Mean	4·8	4·5	3·7	5·4
	Standard deviation	2·41	3·59	2·39	2·49
Organic	Mean	4·6	3·0	5·1	3·6
	Standard deviation	2·37	2·93	2·51	2·65

achieve consistently higher scores in all four categories than any of the psychotic groups. On the other hand the organic group has lower scores than any of the other groups except in the category "affective range," where the organics score higher than the depressed patients. The low scores of the organic patients would be in accord with the general concept of a deficiency syndrome characterizing the mental picture of the patient with organic brain disease (Dörken and Kral, 1952). The manic patients score higher than any of the other psychotic groups in the categories "energy output" and "affective range," while the depressed patients score lowest of all the groups in the category "affective range" and only very slightly higher than the organics in "energy output." This latter difference is not significant statistically. The schizophrenic patients score lower than any other group except the organics in the category "contact with reality."

Certain clinical expectations would have to be fulfilled if the four scoring categories are actually measuring the respective behavioural and psychological aspects designated by their headings. The highest energy output and widest

affective range would be expected in the manic and the lowest scores in these categories in the depressed group. The lowest score in the category "clarity" would be expected in the organic group, and a low score in the category "contact with reality" would fit into the clinical picture of schizophrenia. In Table II will be found the "t" values for the comparison of each of the five diagnostic

TABLE II.—*Significance of Differences Between the Mean Scores* (t *ratio*) *in the Various Diagnostic Groups* ($N = 30$).

Diagnostic group.		Energy output.	Contact with reality.	Affective range.	Clarity.
Non-psychotic/manic	*t* ratio	·36	2·9***	1·4	2·5**
Non-psychotic/depressed.	,,	6·7***	3·0***	9·1***	3·4***
Non-psychotic/schizophrenic	,,	3·5***	3·9***	4·0***	3·6***
Non-psychotic/organic	,,	7·0***	5·6***	6·5***	6·4***
Manic/depressed	,,	5·5***	·36	6·0***	1·0
Manic/schizophrenic	,,	3·0***	1·1	2·1**	1·3
Manic/organic	,,	5·8***	2·4**	4·0***	3·9***
Schizophrenic/depressed	,,	2·4**	·68	4·0***	·33
Schizophrenic/organic	,,	2·7***	1·1	1·9*	2·3**
Depressed/organic	,,	·33	·60	2·3**	2·7***

*** = Significant at the 1 per cent. level.
** = ,, ,, 5 ,, ,,
* = Approaching significance.

groups with each other in the four scoring categories. It can be seen that most of the differences of the mean scores were significant at the 5 per cent. or 1 per cent. level of probability. It is interesting to note that there is no significant difference in the categories "contact with reality" and "clarity" between the schizophrenic and the depressed, the schizophrenic and the manic, and the depressed and the manic. There is also no significant difference in the category "contact with reality" between the schizophrenic and the organic, and the depressed and the organic. It thus appears that the categories designated "contact with reality" and "clarity" show little differences in the degree of impairment among the various psychotic sample groups. Clarity and contact with reality seem to be generally and equally impaired in most severe mental disturbances, but this seems to hold true mainly for the functional psychoses, since the difference in the clarity score between the organic and the other diagnostic groups is always very significant., The lowest standard deviations were obtained by the non-psychotic group and occurred in the categories "energy output" and "clarity."

EFFECTS OF THERAPY.

The scores in the various categories tend to remain rather constant unless there is a change in the patient's mental condition. Dörken (1952) has made a statistical study of the intra-individual test-retest reliability of a series of fingerpaintings in normal controls, in chronic untreated psychotics and in acute psychotic patients receiving active therapy. He found good reliability among his control subjects, very high reliability among the untreated psychotics

but no significant correlation between the serial paintings of psychotic patients under treatment.

An improvement in the patient's condition is usually reflected in an increase of clarity and contact with reality as expressed in the fingerpaintings. Improvement in clarity is, of course, particularly desirable in the organic patient. In the schizophrenic, increased contact with reality is a welcome sign. Insulin coma treatment will often bring about striking changes in these two categories. Schizophrenic patients who have been smearing or consistently produced the effect of "paranoid haze" in their paintings will begin to turn out crisp and bright paintings and indicate by their choice of subject matter (objects in their environment; Christmas trees at Christmas time; shamrocks on St. Patrick's Day; pumpkins around Hallowe'en time; etc.) that their contact with reality has improved. A wide range of colours used is also a favourable development in the schizophrenic, reflecting mobilization of affect. An increase of energy output is only desirable if the patient has been inhibited, as in the case of a stuporous catatonic, a simple schizophrenic, or a depressed patient. On the other hand, a decreased energy output would be considered a favourable sign in manic or excited catatonic patients.

It is apparent that one has to be careful not to evaluate mechanically any changes in the patient's manner of painting, but to approach each case individually and consider the whole pattern of behaviour, attitudes and responsiveness that is present. Changes in the fingerpaintings have only the same significance as changes in the patients' symptoms, and they are subject to the same limitations with regard to the general evaluation of the patient's mental state.

Electro-convulsive therapy is almost invariably responsible for increased energy output and a greater range of affect reflected in the paintings. If many electro-convulsive treatments are administered in a short time, one can usually observe a distinct decrease in the clarity of the paintings reflecting the patient's temporary organic confusion.

During the past two years we have studied the effects of lobotomy on the fingerpaintings of psychotic patients. One or several control paintings were obtained prior to the lobotomy, and after the operation the patient made a painting at weekly and later monthly intervals. During the first month or two, the paintings usually show a decrease in energy output and range of affect as well as in contact with reality and clarity. In fact, the fingerpaintings during this period are very characteristic of the productions of patients with an organic deficiency syndrome. After two or three months a general tendency becomes apparent to use very thick layers of paint, to simplify all objects depicted and to treat them in an almost pathognomically rigid and massive manner. A number of lobotomized patients reveal their tendency to perseveration and paucity of ideas by covering the paper with a large number of dots, which are sometimes arranged according to a pattern and sometimes quite unrelated. Patients who had shown considerable artistic ability prior to lobotomy produce coarser and less imaginative paintings afterwards. However, an increase in clarity, reality contact and affective range often reflects the improvement of the original psychotic disturbance. In cases of chronic depres-

sion one usually observes also an increase in energy output in the fingerpaintings following lobotomy.

The effects of treatment on the drawings and paintings of mentally disturbed patients have been observed by several authors. Fingert, Kagan and Schilder (1939) used the "draw-a-man" test in schizophrenic patients after insulin and metrazol therapy. Mosse (1940) was surprised at the apparent confusion in the fingerpaintings of patients several hours after metrazol shock. Mohr (1940) notes greater realism and freer use of colour in the paintings of a schizophrenic patient during a favourable response to insulin coma treatment. Claude and Masquin (1934) deal with the changes produced by malaria therapy in the artistic productions of a patient suffering from dementia paralytica. Aslow and Kadis (1946) mention the increase of distinctiveness and clarity in the fingerpaintings of disturbed children responding to psychotherapy. No systematic attempt has been made, however, by these authors to provide a reliable measuring scale of the patient's improvement through formal criteria applied to his undirected paintings.

Recently, Hetherington (1952) has published an experimental study on the effects of electro-convulsive therapy on the drawings of depressed patients. He observed that the patient's drawings during and after treatment were larger than those of his control subjects. He also noted a tendency for the drawings to be displaced towards the middle of the page during the treatment period.

Comments.

A statistical treatment of such data as we have presented is limited by the nature of the material. It is not sufficient to group a number of subjects together merely because they have at one time been given the same psychiatric diagnosis. Katz (1931), for instance, reports a preference for red among manic-depressive patients, but fails to state whether his data were collected from patients in the manic or depressed phase of their psychosis. His findings are, therefore, meaningless. We have made every effort to choose patients for our psychotic sample groups who presented a characteristic syndrome and not only an identical diagnostic label. In the case of schizophrenia we decided to include a balanced distribution of the clinical sub-groups rather than to treat them as separate entities. We do not doubt, however, that these sub-groups, if considered separately, would show significant differences, and the same would certainly be true if schizophrenic patients were chosen according to the degree of deterioration present. A sample group of 42 schizophrenic patients selected from a "back ward" and presenting terminal states of personality deterioration gave significantly lower mean scores than the mixed schizophrenic group in all four categories, with the greatest drop occurring in the category "contact with reality." We have previously referred to the possible sex differences with regard to choice of colour and realism of drawing. We have considered this factor to some extent by arranging for an equal distribution of male and female subjects in the sample groups.

The age factor certainly plays an important role in drawings and paintings of the developing individual, but probably loses much of its significance in

the post-adolescent normal subject. We feel that the concept of regression will afford a satisfactory explanation for most of the changes which are observed in the paintings of psychotic patients. Particularly the scoring categories "contact with reality" and "clarity" are likely to reflect regressive tendencies. Hurlock and Thomson (1934) conclude from their data that accuracy of perception is positively related to age and intelligence. Cockrell (1930) found that the drawings of older children can be differentiated from those of younger ones by the presence of a guiding idea and purpose. Lange (1933) notes the greater self-criticism of the post-adolescents as compared with younger subjects towards their drawings. Factor analysis of scores based on drawings has been applied by Findlay (1936) and by Koga and Naka (1940). They found that perception and memory seem to be involved. Schilder and Levine (1942) conclude that the disturbance of the basic motor drives in the mentally disordered individual leads to disturbances in their drawings.

Our study has not been concerned with the artistic qualities of the fingerpaintings. Tiebout and Meier (1936) have observed a low correlation of the artistic merit of drawings with standard tests of intelligence. We have often been struck by the observation that the aesthetic and artistic value of a patient's paintings may show a definite decline, while the scores in the formal criteria of his paintings improve simultaneously with the improvement of his mental condition. As a general rule, one may state that a tendency to produce prosaic commonplace paintings reflects a favourable trend in a psychotic patient.

It should be understood that no psychological or psychiatric evaluation of a non-directed drawing or painting is complete without the consideration of its content. This aspect has been dealt with by most of the authors who have written on the subject It is, in our opinion, a dangerous practice to generalize the diagnostic interpretations of such highly individual features as the choice of certain symbols or other representational subjects. It may be safely assumed, on the other hand, that any experienced psychiatrist or psychologist nowadays will be able to arrive at an adequate interpretation of the content of a drawing or painting, given sufficient time, information and cooperation by the painter.

Summary.

1. A method of evaluating fingerpaintings of psychotic persons is described which is applicable to any patient, allows for repetition and quantitative comparison with other paintings, and does not require observation of the patient during the painting process or interviewing him afterwards.

2. The method is based on the experiences gained with the material of 942 patients who produced close to 6,000 paintings. It consists in scoring the paintings in four categories which designate characteristic formal aspects of each painting:

a. Energy output.
b. Contact with reality.
c. Affective range.
d. Clarity.

3. The rationale for the selection of these four scoring categories is given. It is assumed that they designate characteristics of the clinical condition of the patient as well as of his paintings.

4. The system of scoring is described. The measuring scale extends from 1–12, with a score of 8 representing the optimal score.

5. Statistical analysis of the mean scores obtained by five sample groups (non-psychotic; manic; depressed; schizophrenic; organic) in the four categories yields significant differences in the ratings of the fingerpaintings, which are in accordance with the characteristic clinical features of the syndrome represented by each sample group. These differences tend to confirm the thesis that the four scoring categories actually measure the behavioural, intellectual and affective aspects they designate.

6. The fingerpaintings of patients who are responding to treatment usually show typical changes, and reflect in the improved scores the patient's improved mental condition. The effects of shock therapy and lobotomies are described.

7. The concept of regression may afford an explanation for the reversible changes occurring in the fingerpaintings of psychotic patients, since some of the most characteristic features found in the paintings of psychotics are also present in the paintings of children.

8. There is no positive correlation between the artistic merit of a patient's painting and his clinical condition.

9. Detailed consideration of the content of a painting requires individual analysis. Generalized interpretations may be misleading.

10. Emphasis is placed on the need for observing changes which occur in a series of paintings when the patient acts as his own control. The evaluation of symptomatic changes in a number of paintings produced over a period of time is more reliable than the diagnostic interpretation of single paintings.

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NEW DATA ON MARRIAGE AND MENTAL DISEASE: THE INCIDENCE OF PSYCHOSES IN THE WIDOWED AND THE DIVORCED.

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It may be regarded as an established fact that the incidence of mental disorder is much higher in the single than in the married. In a previous paper two possible explanations were discussed:

1. There is a *selection by marriage*, whereby individuals who are personally and socially handicapped tend to remain single. Among such possible marriage handicaps there are certain personality traits which correlate markedly with a predisposition towards certain forms of mental disease, in particular schizophrenia.

2. There is a *protection by marriage*, which protects the married against the outbreak of mental disease, to which the same individual would have succumbed had he remained single.

The widowed and the divorced may offer a clue to the solution of this problem, because in these groups the hypothetical protection has ceased to exist, while the factor of selection remains, and so can be studied in isolation. Actually, however, this experiment is not so clear-cut. The widowed do not merely lose the social and personal protection of married life, but will in many respects have to adjust to more serious problems than if they had never been married at all. This is far from being a general rule, however, and a number of widows or widowers continue to enjoy at least some of the privileges of married life, such as home and children.

As to the factor of selection, it actually does not remain the same in the widowed and the divorced, because a fairly large number of them re-marry. It is well known that those who re-marry represent a positive selection with regard to physical health and social success, and most likely they represent a similar selection with regard to personality type and mental health.

In the present paper this problem has been studied on a somewhat enlarged material, consisting of all first-admissions to mental hospitals in Norway 1931 to 1945, a total of 23,115, including 1,441 widowed and 515 divorced patients. In Table I, the single and the married are compared, the widowed and the divorced being included with the married. The results are practically identical with those previously published, and a detailed discussion is therefore omitted. Evidently the predominance of mental disease among the single varies according to sex and to psychiatric diagnosis. It is somewhat more marked in men than in women, and it is decidedly higher for schizophrenia than for manic-depres-

TABLE I.—*Rates of Admission per* 100,000 *per year for Single and Married.*

The widowed and the divorced are included with the married. The rates are standardized, and include all age-groups from 20 to 89 years.

	Men.			Women.		
	Single.	Married.	S./M.	Single.	Married.	S./M.
Psychosis with mental deficiency	71	7	9·7±1·69	55	11	5·1±0·69
Epileptic psychosis	21	5	4·4±1·31	13	5	2·8±0·59
Schizophrenia	534	124	4·3±0·24	495	133	3·7±0·14
Reactive, and ps. with const. psychop. inf.	154	76	2·1±0·14	218	116	1·9±0·09
Symptomatic psychosis	29	14	2·0±0·30	31	32	0·9±0·11
Senile and arteriosclerotic	96	62	1·6±0·14	121	60	2·0±0·12
Manic-depressive	92	62	1·5±0·12	121	91	1·3±0·08
Alcoholic psychosis	34	22	1·5±0·20	—	—	—
Organic psychosis	25	17	1·5±0·23	17	12	1·5±0·23
General paresis	76	57	1·3±0·11	19	24	0·8±0·10
Other and indefinite forms	6	3	1·9±0·80	4	5	0·8±0·24
All diagnoses	1,138	449	2·5±0·06	1,094	489	2·2±0·05

sion. It is low in symptomatic and organic psychoses of all types (except epileptics), while it is particularly high in psychoses with mental deficiency. These facts all seem to point towards the factor of selection : The pre-psychotic marriage handicap is clearly largest for the frequently schizoid and shut-in schizophrenics, as well as for epileptics and mental defectives.

In Table II a similar comparison is made between the married, the widowed and the divorced. The single are left out, as their age distribution differs so

TABLE II.—*Rates of Admission per* 100,000 *per year for Married, Widowed and Divorced,* 30–69 *years of age.*

The rates are standardized, the total population of Norway, male and female, married and formerly married, being used as a standard.

	Men.			Women.		
	Married.	Widowed.	Divorced.	Married.	Widowed.	Divorced.
Schizophrenia	101±3·8	189±37	501±66	137±4·5	159±19	486±41
Reactive	88±3·5	136±30	274±49	131±4·4	195±22	314±41
Manic-depressive	86±3·5	123±26	101±29	117±4·3	129±14	166±31
Senile (50–89 years)	210±9·3	188±16	394±101	177±11	249±13	549±112
Alcoholic	26±1·9	31±13	212±39	4±0·8	4±2·5	58±18
General paresis	77±3·3	102±25	278±49	30±2·2	43±9	132±27
Epileptic and with mental deficiency	13±1·3	11±10	86±27	13±1·4	17±5	103±24
Remaining diagnoses	59±2·9	41±14	279±49	65±3·1	70±13	95±24
All diagnoses	490±8·4	675±64	1,780±134	548±9·1	691±38	1,452±91

markedly from that of the rest that their inclusion would tend to confuse the picture even with rates standardized for age. In spite of the somewhat large standard errors, the tendency is clear. The incidence of mental disease is somewhat higher in the widowed than in the married, but the difference is not nearly of the same order as that between the married and the single. This finding is not in favour of the hypothesis of "protection by marriage." The loss of such protection by the death of the spouse may not be a total one, but

it would certainly be expected to result in a much more marked increase in the morbidity than is actually found in the widowed.

The moderately raised incidence rates in the widowed result more probably from a selection by re-marriage, and a more detailed statistical analysis supports this view. The difference between the married and the widowed is most marked in the male sex, which is just what would be expected as a result of the selection by re-marriage, because widowers re-marry more frequently than widows. Furthermore the excess morbidity of the widowed is higher for schizophrenia than for manic-depression, and the personality background of schizophrenia is much more likely than that of manic-depression to constitute a marriage handicap (or, in this case, a re-marriage handicap).

The excessively high morbidity rates found for the divorced clearly result from selection rather than from any loss of protection by marriage. In addition to the pre-psychotic personality background, incipient psychotic symptoms play an important role in this connection, by leading to marital incompatibility and divorce before they are recognized as pathological or abnormal.

In Table III age-specific rates are compared. In the male sex the excess morbidity of the widowed is very high in the youngest age-groups, while above

TABLE III.—*Rates of Admission per* 100,000 *per year for Separate Age-groups, all Diagnoses.*

	Men.				Women.			
	Single.	Married.	Widowed.	Divorced.	Single.	Married.	Widowed.	Divorced.
25–29	122	22	117	124	107	34	44	47
30–39	183	42	80	196	160	55	61	121
40–49	174	53	72	200	156	58	78	182
50–59	132	50	54	180	135	56	82	139
60–69	124	53	54	102	112	48	50	135
70–79	96	54	51	179	97	39	53	185
80–89	76	84	40	71	87	50	44	78

the age of 50 it is no longer noticeable. Now re-marriage is more likely to occur among young widowers, and men below the age of 50 *who have remained widowers* are consequently likely to represent a negative selection with regard to health and to social and personal adjustment.

In the female sex the influence of the age factor is much less clear and pronounced—probably because remarriage is less frequent in widows than in widowers and because selection is less effective in the female sex. The excess morbidity of the widows has a decided maximum in the fifties, which is not found in the male sex. It will be shown later that depressive psychoses elicited by the death of the spouse are fairly common in women of this age.

In the male sex senile and arterio-sclerotic psychoses (particularly above the age of 80) are actually more frequent in the married than in the widowed. This exception to the general rule is not easily explained. It is possible that to an old man married life may represent some sort of stress, but more likely variations in the tendency to have senile cases hospitalized are responsible.

In spite of the numerous sources of error the conclusion seems justified that the statistical data give little or no support to the hypothesis of a protection

by marriage. The hypothesis of a selection (by marriage and by re-marriage) is decidedly more compatible with the statistical findings. Evidently a closer examination of the individual cases is needed for a further approach to the solution of our problem, and it is the main weakness of the statistical method that such an examination of a sufficiently large number of patients is impracticable. As a compromise a clinical study has been made of the case-histories of 206 unselected patients from the Gaustad Mental Hospital, who were widowed or divorced on admission.

The Widowed.

In the widowed the clearest evidence of etiological connection between the outbreak of psychosis and the cessation of married life is found in the group of 35 widows admitted for *depressive psychoses.* In 8 of these cases it seems fairly certain that the death of the husband was a direct cause for the depressive reaction. These patients were women in the late forties or the fifties, most often with grown-up children. The death of their husband occurred after prolonged illness, which had resulted in much mental strain and financial difficulties. In two of the cases the depression started already during the last months of the husband's life. The content of the depression was mostly a feeling of grief and lonesomeness—missing even the hardships of nursing a chronically invalid husband, and feeling useless and out of place even with kind relatives. In two cases financial problems were (at least consciously) the main concern of the patient. Only in one case did the depression centre around self-accusatory delusions (concerning marital incompatibility of long standing). From the case-histories one gets the impression that these women broke down under conditions not definitely more unfortunate than those of the average widow, but on the other hand there is not much evidence of any predisposition towards neurotic or depressive reactions. One of these eight widows was decidedly overdependent and infantile in her relations with her husband, another had suffered two previous depressions.

In five additional patients the connection between the death of the husband and the depression is rated as *possible.* In one case the causality was reversed, and the patient's disease (an agitated, hypochondriacal depression of several months' standing) actually was the cause of her husband's death by suicide.

In the male sex depressive psychoses caused by the death of the spouse seem to be much less common. Among our 51 widowers 11 were suffering from depressive psychoses, but in one single case only was the causal connection with the death of the wife probable, and in addition to this four cases were rated as possibles.

The group of *schizophrenia* and paranoid conditions contains 11 widowers and 15 widows, but in none of these cases the death of the spouse seems to have been an etiological factor of primary importance. Ten cases are listed as possibles, however. Two widows developed paranoic reactions in connection with economic and social difficulties following the death of their husband. Two widowers suffered from paranoid prison psychosis, while they were serving sentence for incestuous relations with their daughters, which

TABLE IV.—*The Causal Connection between Death of the Spouse and Psychosis.*

		The death of the spouse caused the psychosis.		The death of the spouse led to hospitalization.	
Men :	No.	Probably.	Possibly.	Probably.	Possibly.
Depressions	11	1	4	—	1
Excitements	1	—	—	—	—
Paranoid states	11	—	6	—	1
Senile	21	1	4	—	6
General paresis	5	—	—	—	—
Alcoholic	2	1	1	1	—
All diagnoses, men	51	3	15	1	8
Women :					
Depressions	35	8	5	—	1
Excitements	8	1	2	—	—
Paranoid states	15	—	4	—	2
Senile	23	—	1	1	3
General paresis	3	—	—	—	—
All diagnoses, women	84	9	12	1	6

began after the death of the wife. Interesting is the case of a highly intelligent, schizoid labourer, who lost his wife after 19 years of rather unhappy married life. Less than a year afterwards he developed a paranoia erotica, with delusions of mutual love and impending marriage.

One widower and eight widows are classified as *excitements* (maniacal or hysterical). One of the widows developed an acute psychosis with paranoid and confusional trends ten days after the death of her husband. The case was regarded as a "flight into illness," and complete remission came within 4 months. In two cases there was a possible causal connection, but altogether excitements seem to be less commonly caused by the death of the spouse than are depressions.

In the group of *senile, arteriosclerotic* and other organic psychoses (22 widows and 21 widowers) there was a probable causal connection in one case, and two more were rated as possibles. Somewhat more often (in six men and four women) social conditions connected with their lonely existence seems to have contributed towards hospitalization of senile widows or widowers. In one case we hear definitely that the patient had suffered from a somewhat periodical psychosis for a number of years, but her husband did not want to have her admitted. After his death the children managed to nurse her in the home for two years, but then had to give up. In other cases we hear more vaguely that the patient is cared for by married children, by neighbours or in nursing homes, but becomes "too difficult," or there is no one to take care of them after the death of the spouse.

Five of our widowers and three of the widows suffered from general paresis, and in five of these eight cases the spouse is known to have died from causes connected with syphilitic infection. Evidently the reason why the incidence of paresis is higher in the widowed than in the married (Table II) is that the spouses of paretics have an increased mortality owing to conjugal infection.

Alcoholic psychosis is observed in two widowers only. Both were chronic alcoholics, but the death of the wife led to increasingly heavy drinking.

The Divorced.

The divorced present an entirely different picture. Among the 71 divorced patients not a single case could be found in which it could be established as probable that the outbreak of the psychosis was caused by the divorce, or by the marital incompatibility leading up to the divorce. In seven cases there was a possible causal connection, but none of them were very convincing. On the other hand it was found that in 46 of the 71 cases the divorce was probably caused by the psychosis—either by mental symptoms, or by symptomatic alcoholism. This is particularly true of the *schizophrenics*, who were mostly of the paranoid type. In all the 15 male schizophrenics and in 15 out of the 20 female ones the divorce was probably caused by the psychotic symptoms, or by heavy drinking which developed in connection with the psychosis. We hear for instance that the patient was unable to perform her house-work, or that she simply left her husband and her children, or that her erotic paranoia made the marriage impossible. Of the male patients we hear that they were drinkers or poor providers, or brutal. Two of them had incestuous relations with their daughters. Only in one of these 30 cases was the condition recognized as a mental anomaly at the time of the divorce proceedings. In the remaining ones the diagnosis was not made until later on, mostly within one or two years. Cases in which divorce was granted on the grounds of insanity are, therefore, not included in our material.

TABLE V.—*Causal Connection between Divorce and Psychosis.*

		The divorce caused the psychosis.		The psychosis caused the divorce.	
Men:	No.	Probably.	Possibly.	By alcoholism.	By symptoms.
Depressions	3	—	1	1	—
Paranoid	14	—	1	8	7
Senile	2	—	—	1	1
Alcoholic	8	—	—	7	1
Total for men	27	—	2	17	9
Women:					
Depressions	7	—	2	—	—
Excitations	6	—	—	1	4
Paranoid	20	—	3	—	15
Senile	5	—	—	—	—
General paresis	7	—	—	—	—
Total for women	45	—	5	1	19

In eight male patients with *alcoholic* psychoses the man's drinking was the direct cause for the divorce in every case. Only in one of them did actual psychotic symptoms (paranoic and hypomanic traits) play any role.

In the small group of six patients (all women) who were suffering from *excitements* of various types the findings are closely similar to those in the schizophrenic group: in none of these cases could the divorce be shown to have had any etiological significance, whereas five of these six women were divorced by their husbands because of pre-psychotic or psychotic symptoms of a manic or hysterical type. In the ten *depressive* patients, on the other hand,

the divorce did not have any connection at all with the psychosis, and in merely one case with a complicating alcoholism.

In two out of seven *senile and arteriosclerotic* cases the divorce was caused by psychotic symptoms or symptomatic drinking. In the seven divorced women suffering from *general paresis* no causal connection was established, but generally these patients had a poor social background, and had shown looseness of character and behaviour before as well as during their married life.

In view of these findings the excessively high incidence of mental disease in the divorced must clearly be regarded as a result of social selection, based upon pre-psychotic and psychotic traits.

Conclusions.

The statistical and clinical data, which have been discussed in the present paper and in a previous publication, suggest that the main factor in the interplay of marriage and mental health is what might be called the *selection by marriage*. Certain personality traits reduce the chances of getting married, by making contact with the opposite sex more difficult or less attractive, or indirectly by blocking the way towards social and economic success. Some of these traits are disproportionately common in persons who are predisposed towards certain psychoses, or in the initial stages of such disorders. This is particularly true of a number of traits which cluster around such concepts as "schizoid," "schizothymic" or "sensitive," but generally most of the personality types which are characterized as "unbalanced" or "unstable" lead to a decided marriage handicap. These are the main reasons why schizophrenia, as well as psychotic reactions of a sensitive and hysterical type, are more common in the single than in the married. The same applies to psychoses which develop upon a background of feeble-mindedness or epilepsy. Manic-depressive psychosis, on the other hand, is nearly as common in the married as in the single, because the personality background for this psychosis is unlikely to represent a marriage handicap. The same is true of organic and symptomatic psychoses, including general paresis and alcoholic psychoses.

It would seem likely that a "protection by marriage" against certain conflicts and problems which occur more readily in the life of single persons may be responsible for part of the excess morbidity of the single. One would, for instance, think of the complex of social and personal problems which Kretschmer has described as the typical background for certain forms of his "sensitive Beziehungswahn." On the other hand it is not self-evident (perhaps not even likely) that environmental factors should at this age (25–30 years and upwards) play any decisive role in the development of psychotic reactions. For psycho-neuroses, on the other hand, it is much more likely.

The death of the spouse does not immediately lead to any change in the "selection by marriage." Widows and widowers remain a positively selected group. This explains why the incidence of psychoses remains low in the widowed, in spite of the obvious environmental difficulties which they have to face. If protection by marriage were a factor of real importance for the low morbidity of the married, then one would certainly expect a more conspicuous rise in the morbidity after the death of the spouse. In some cases mental

strain connected with the death can be shown to lead more or less directly to a psychotic breakdown. Such reactive psychoses are most common in women, and are mostly of a depressive character. They are responsible for the somewhat raised incidence of affective disorders in widows.

In the course of time a certain selection takes place in the widowed, because some of them re-marry. This selection is probably of the same nature as the original selection by marriage, and consequently leads to a somewhat raised morbidity from schizophrenia and allied psychoses.

In the divorced the incidence of psychoses is nearly as high as in the single, and much higher than in either the married or the widowed. Now psychoses elicited by the divorce are in our clinical material very rare. On the other hand, pre-psychotic personality traits or initial psychotic symptoms are very often found to have been the cause of marital incompatibility and divorce. This makes the divorced a selected group, and explains why they show a very high incidence of schizophrenia, alcoholic psychoses and general paresis, while the incidence of manic-depression is the same as in the married, or even lower.

Summary.

The high morbidity from psychoses in the single and the divorced as compared with the married and the widowed is discussed, on the basis of statistical and clinical material. It seems that a *selection by marriage* with regard to personality traits and mental health is the main cause, while a *protective influence* of married life could not be positively shown to exist. The problem of selection versus protection is felt to be a useful formulation of the more general problem of constitution versus environment, or of nature versus nurture. But a statistical investigation based upon the incidence of psychoses is naturally too crude in its method and too restricted in its scope to warrant anything but the most tentative conclusions.

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EXPERIENCES AND RESULTS IN PREFRONTAL LEUCOTOMY: A CLINICAL STUDY OF 339 LEUCOTOMIZED PATIENTS.

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[Received 2 April, 1953.]

From October, 1947, to October, 1952, we have had the opportunity of performing prefrontal leucotomy on 339 patients at the Neurosurgical Clinic in Belgrade. As this operation is of importance in the treatment of mental disease we consider it necessary to report our experiences and our results.

We analysed the methods of surgical treatment in mental cases in general, and especially in various forms of psycho-neurosis, and having judged the results which had been published, we almost immediately decided in favour of standard prefrontal leucotomy. We used this method in almost all cases in our series, with certain modifications in some cases.

The first patients sent to us by the psychiatrists were mainly serious and chronic schizophrenics who had been treated for years without success. As far as psychic recovery was concerned the results were fairly good in the first series, so the psychiatrists later sent us patients more suitable for leucotomy, i.e., patients in the first years of their illness as soon as shock treatment had proved unsuccessful.

The psychiatrists made their choice of patients for operation and set forth the indications for leucotomy. According to the diagnosis and form of schizophrenia the surgeon would decide on a certain modified method of prefrontal leucotomy. The indications against immediate prefrontal leucotomy were: high temperature, active tuberculosis, suppurative processes, heart diseases and general weakness. Such patients had to undergo preliminary treatment before the operation.

Method of Operation.

In most of the cases of schizophrenia leucotomy was performed under a local anaesthetic, the patient being given sufficient doses of narcotics as a preliminary measure. Agitated patients were given a general anaesthetic with intravenous pentothal sodium. Later we made certain modifications in the Duff-Moniz operative procedure. Skin incision over the coronal suture directed towards the pupils. A $\frac{1}{2}$ in. trephine or burr hole and a wide enlargement of the trephined opening was used. The leucotome was inserted through the dura, which had been opened in cruciate fashion, and was inserted as far as the posterior part of the orbital wall. This was followed by a subcortical severing of the frontothalamic paths just in front of the anterior horn of the lateral ventricle,

first on one side and then on the other side. When there was suspicion of a hydrocephalus, the position of the anterior horns was ascertained by a puncture with a cannula and leucotomy was performed anterior to the ventricles. The severing was performed as extensively as possible, mainly subcortically and anterior to the ventricles. Kennedy's observations on the importance of an extensive section and its direction in the white substance in the results of leucotomy are undoubtedly correct and have been empirically confirmed by us.

With a view to achieving more favourable results with regard to mental recovery and in order to avoid ill-effects in certain cases we made slight changes in the standard leucotomy already described, these being insignificant modifications in the plane and extent of incision, i.e., we performed so-called selective leucotomies. In the case of highly agitated and more active patients we made more extensive section of the upper parts of the frontothalamic paths, sparing the gyrus cinguli on the inner side. In the case of patients with obvious emotional trouble, the severing of the parts at the base was more extensive. With a view to better orientation in the blind severing of the white matter of the brain, we used a specially constructed Duff leucotome which, owing to its outer localizer, greatly facilitated the described modification of prefrontal leucotomy.

All our patients stood leucotomy comparatively well and without any special visible outward reaction. Rarely, haemorrhage, usually from the veins, may occur during the operation as an immediate complication, it comes from superficial vessels of the brain and can be quickly and easily checked. It appears to us that more serious haemorrhage occurring immediately after the section with Duff's leucotome is an exceptionally rare complication, and during the whole series of 339 patients we encountered it only once. When post-operative haemorrhage was suspected we took X-ray pictures with Myodil in several cases as a check-up. This was done according to the method of Sjöqvist and others. In this manner one can check the scope of prefrontal leucotomy and possible intracerebral haematoma by the radiographic appearances.

In the method of leucotomy which we have used, the cutting of the basal ganglia and pyramidal paths and the consequent appearance of enuresis, disorientation and pathological reflexes (Babinski) is extremely rare. During operation we noticed no conspicuous phenomena referable to the vegetative centres, no significant changes in blood pressure, pulse, breathing or temperature. During the first few days after operation these were all more or less normal. During the first few days the temperature usually rises to 38° C. The effects of oedema of the brain and minor haemorrhages in the brain are rarely observed clinically and are mild and transient when they occur. Likewise sweating, akinesia, aphasia, amnesia and a positive Babinski sign rarely occur, and if they do, pass quickly. In a small number of cases there were post-operative complications in the form of convulsions of the epileptic type, usually Jacksonian. In the whole of our series of 339 leucotomies, there were epileptic attacks only in 11 cases (about 3 per cent.), and of this number only three were permanent. In one of the latter there had been attacks before the operation. It is undeniable that there are advantages of a technical character (better orientation during section, better haemostasis, etc.) in the open method which is advocated by

FIG. 1.—Direction of standard prefrontal section (indicated by dotted line).

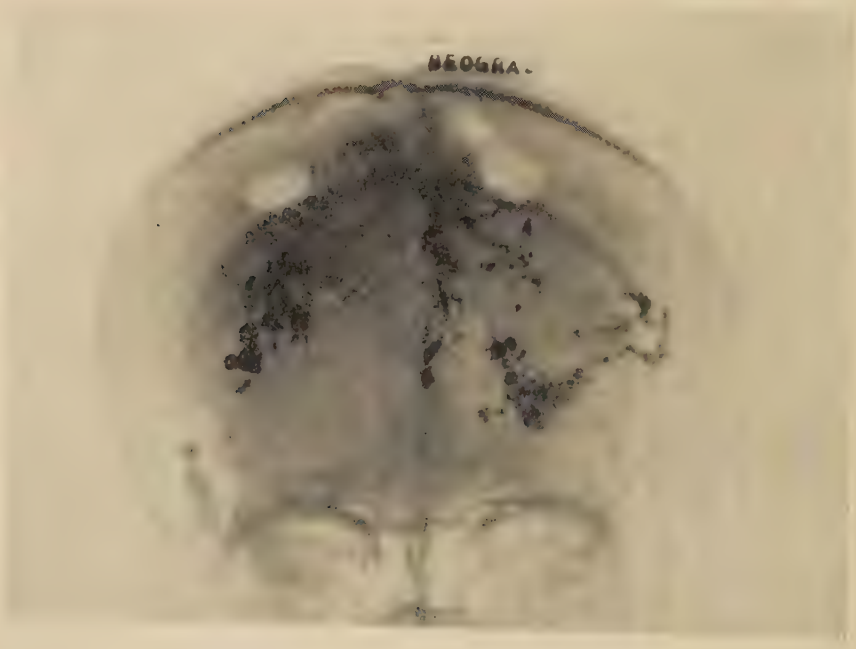


FIG. 2.—Myodil x-ray A-P picture of head immediately after leucotomy.

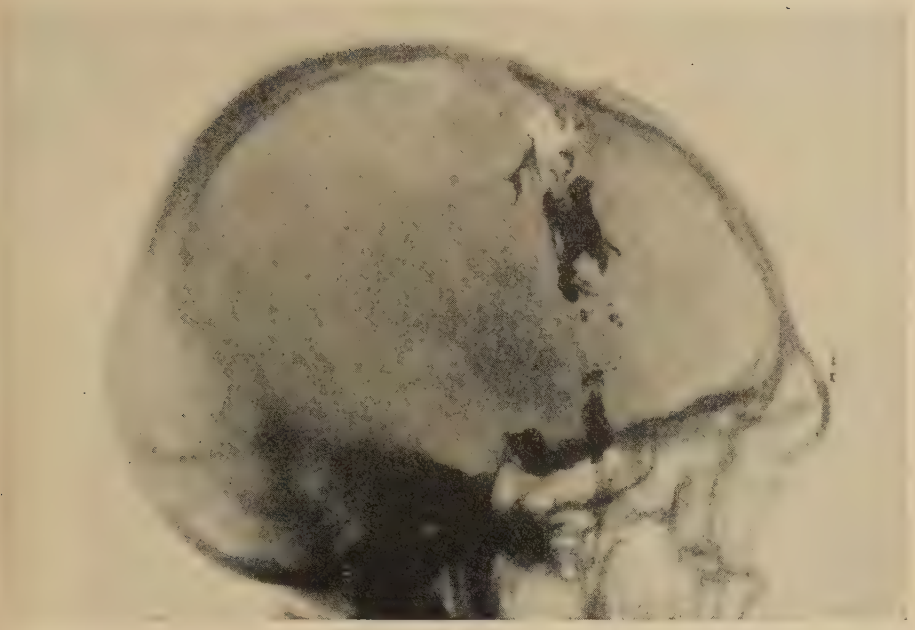


FIG. 3.—The same case, x-ray lateral picture of the head (excludes post-operative intracranial haemorrhage).

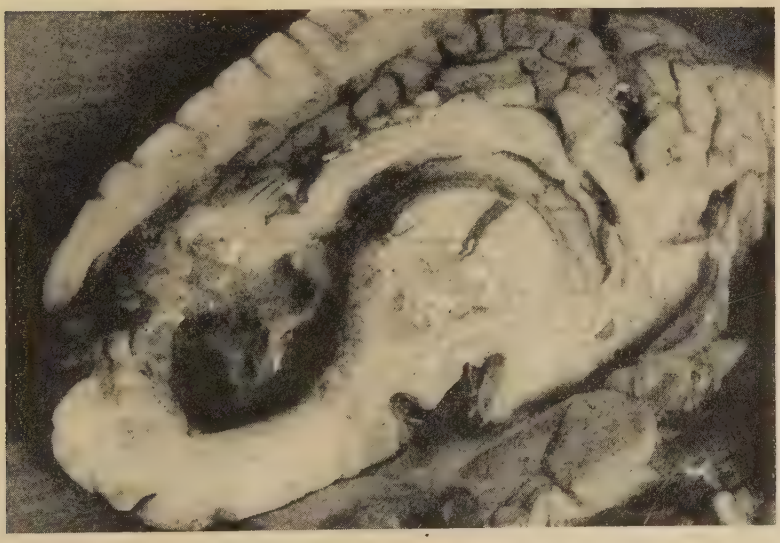


FIG. 4.—Post-mortem specimen : hematoma in the right frontal lobe. (Patient R. K—, 27 years old ; death occurred 16 hours after leucotomy.)

Lyerly, Poppen and others. It is likewise true that the contemporary modification of leucotomy of the closed type (Moniz, Duff) gives equally good results in mental recovery, and does not represent a serious operation which might have serious complications (haemorrhage, convulsions, etc.) such as are encountered in the open method of prefrontal leucotomy. Among the closed modifications we strictly avoid the transorbital leucotomy of Fiamberti, now recommended by Freeman, Moore and others, and which many neurosurgeons consider a most unsurgical method. This is a completely blind procedure, in which it is impossible to control intracranial haemorrhage.

Fig. 5.—Brain specimen: post-mortem finding eight months after leucotomy. (Female patient, V. K—, 12 years old.)

Operative Mortality.

In our series of 339 leucotomies we had 10 fatal cases, which constitutes a mortality of about 3 per cent. The postmortem showed post-operative haemorrhage—intracranial haematoma—as the cause of death in only two cases. In one case the arteria cerebri anterior had been severed, causing a haematoma. Apart from this there were oedema of the brain, fatty degeneration of the heart and miliary tuberculosis of the lung on both sides. In the remaining eight cases, the cause of death in three was degeneration of the heart muscle, in two a brain abscess and in three meningo-encephalitis. The infection was probably of endogenic origin. Later another four patients died in the mental hospital from various intercurrent diseases which had no connection with the leucotomy. Among these there was a patient, V. K—, 12 years old, whose post-mortem examination, eight months after the operation, showed subcortical incisions in front of the anterior horns in both frontal lobes, not communicating with the lateral ventricles. The case reported by McGrath was similar, the post-mortem, performed $5\frac{1}{2}$ years after the successful operation, showing degenerative changes in the thalamus and primary injury of the brain.

Mental Changes.

Immediately after leucotomy there were often dramatic changes in the mental condition. Mental recovery usually appeared in the form of a relaxing of the emotional strain, the absence of affective symptoms and psychomotor agitation. Apart from this in most of the cases paranoid obsessions and various kinds of hallucinations disappeared Our psychiatrists noticed that if the early psychic changes, such as excitement, disorientation, apathy, euphoria and objectionable behaviour, did not disappear immediately after the operation, they usually disappeared in the course of the first few weeks. In the same series, we also noticed, but much less frequently (about 6 per cent.), certain moderate negative psychic phenomena which rather change the personality of the patient, and which in a small number of cases are permanent.

Mental improvement usually appears in the course of the first 3 to 4 months after leucotomy. Therefore it was only several months after the operation that we were able to ascertain definitely whether there were any psychic changes, either for better or for worse. Taking into consideration all these points, as well as the definite mental changes, the psychiatrists assessed the results of the operation according to the degree of mental recovery and classified the cases in three groups: First group: complete recovery or practically cured, (these were able to return to their former occupation and to work satisfactorily). Second group: considerably improved, able to do simple work, able to keep the general rules of hygiene, interested in their surroundings and cause no disturbances. Third group: mental condition unchanged; obliged to remain in mental hospitals. According to this assessment, prefrontal leucotomy in the schizophrenic cases, performed on 301 patients in various stages of the disease and on patients of various ages, after a shorter or longer illness, gave the following definite results:

Results of Prefrontal Leucotomy.

From October, 1947, till October, 1952, 339 patients in all were operated upon. Among these, 301 cases suffered from schizophrenia, 14 from psychoneurosis, 16 from imbecility, 3 from intractable pain owing to inoperable carcinoma and metastasis, and 2 from serious neurasthenia. Totalling 301 cases of schizophrenia, i.e., 89 per cent., and 38 cases suffering from other diseases, i.e., 11 per cent.

Statistics of 301 *Cases Leucotomized for Schizophrenia.*

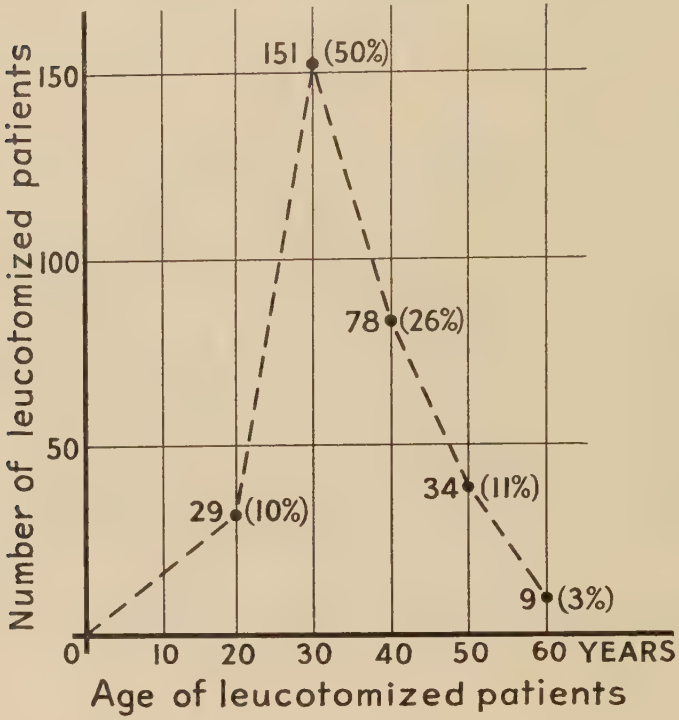
Males 183 (61 per cent.); females 118 (39 per cent.).

Operated Cases by Age:

In the second decade: 29 (10 per cent.).
In the third decade: 151 (50 per cent.).
In the fourth decade: 78 (26 per cent.).
In the fifth decade: 34 (11 per cent.).
In the sixth and upwards: 9 (3 per cent.).

Form of Schizophrenia :

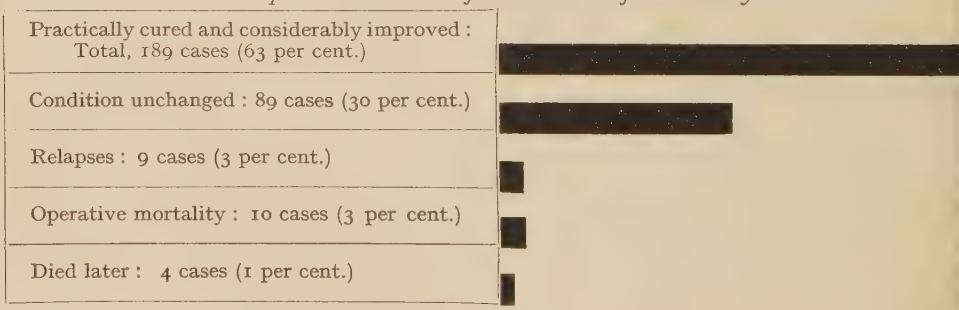
Hebephrenia 119 cases (39 per cent.).
Catatonia 98 cases (33 per cent.).
Paranoid state 84 cases (28 per cent.).
Re-leucotomy (among 301 cases of primary leucotomy) performed in the case of a relapse : 9 cases (3 per cent.).



Results of Leucotomy in Schizophrenia.

Number of operated cases.	Form of schizophrenia.	Practically cured.	Considerably improved.	Condition unchanged.	Relapses.	Operative mortality.	Died later.	Tot mo tali
119	Hebephrenic	30 (25%)	43 (36%)	33 (28%)	8 (7%)	3 (2%)	2 (2%)	5 (
98	Catatonic	17 (17%)	45 (46%)	32 (33%)	—	3 (3%)	1 (1%)	4 (
84	Paranoid state	21 (25%)	33 (39%)	24 (29%)	1 (1%)	4 (5%)	1 (1%)	5 (
301	Total schizophrenic	68 (23%)	121 (40%)	89 (30%)	9 (3%)	10 (3%)	4 (1%)	14 (

Graphic Illustration of the Results of Leucotomy.


Practically cured and considerably improved : Total, 189 cases (63 per cent.)
Condition unchanged : 89 cases (30 per cent.)
Relapses : 9 cases (3 per cent.)
Operative mortality : 10 cases (3 per cent.)
Died later : 4 cases (1 per cent.)

Leucotomy was likewise performed in 14 cases of serious psychoneurosis (obsessions and various forms of phobia) : 5 males and 9 females. Their ages varied from 20 to 50. All earlier conservative treatment had been without results. The illness had lasted from 5 to 10 years. The results of leucotomy : cured 8, improved 5, and one unchanged.

One male and one female patient were leucotomized for serious neurasthenia. The illness had lasted for 2 years. One case showed a good result, while the second remained unchanged.

We performed prefrontal bilateral leucotomy in three cases of intractable pain caused by inoperable cancer and metastasis. The patients were all over forty. After operation the intractable pains disappeared and the patients no longer asked for drugs. All three patients died later. The post-mortem showed metastasis in various organs. According to the experiences of Lyerly bilateral leucotomy is surer than unilateral section in the case of intractable pain.

Comment on the Results.

Most of our patients were chronic schizophrenics, who were leucotomized 5, 6 or even more years after the illness had begun. All of them, without exception, had previously been subjected to shock treatment which yielded no results. A large proportion of these patients were hopeless patients and were considered incurable. About 60 per cent. of our patients were up to 30 years old, while the remainder were in their fourth, fifth and sixth decades. 61 per cent. were males and 39 per cent. females. In most of the cases the same psychiatrists who had treated them before the operation judged the post-operative results. We have considered only the results of leucotomized patients from five years ago till four months ago.

Undoubtedly many factors influence the operative results. Among these we must mention age, sex, duration of the illness, general condition of the patient, the kind of preoperative treatment, general living conditions, etc. Among the factors also to be mentioned are various organic disturbances of the brain, such as secondary symptoms after meningitis, encephalitis, as well as cases of idiopathic cerebral atrophy (with convulsions and other symptoms) ; all these can often be discovered during leucotomy. Opinions as to whether these phenomena influence the results of leucotomy performed for psychosis still differ. Margolis reported a case of serious schizophrenia with an extensive hydrocephalus, where psychometric studies 15 months after leucotomy had been made, showed only slight remains of the organic changes in more serious damage of the brain. According to the psychiatrists of the State Mental Hospital in Belgrade, the average results after leucotomy were better in females than in males. Chronic patients, who had suffered for 5, 6, 10 and even more years, usually showed results as good as those obtained in patients who had been operated on much earlier. It appears that the form and stage of schizophrenia has a greater influence on the operative results than the actual duration of the illness. It likewise appears that organic changes in the brain, which are frequently discovered, only slightly influence the results of prefrontal leucotomy as a whole. We had slightly more recovered cases of the paranoid forms than

of catatonic forms and hebephrenia. The statistics of other authors show roughly the same results. (Gillies, Hickson, Mayer-Gross, *Brit. Med. J.*, 8 March, 1952; Smolik and others, *Postgrad. Med.*, **3**, 179, March, 1948; according to E. A. Smolik and others, St. Louis University, *The* 1948 *Year Book of Neuropsych. and Neurosurgery*, Chicago.)

It is an undisputable fact that the personality of the patient has a considerable influence on the operative results, whether it be intact or more or less changed and deteriorated. A considerable number of our patients showed a more or less deteriorated personality before the operation. This will be referred to in detail by the psychiatrists who treated them at some other time. Ström-Olsen and others particularly stress the importance of an intact personality in chronic cases, and they have set more precise indications for prefrontal leucotomy in order to obtain better results in the sense of social rehabilitation after the operation. The definite results of leucotomy reported by Gillies and Hickson likewise point in this direction.

Of the 189 recovered cases which left hospital, there were relapses in 9 cases. This number of 9 cases, i.e., 3 per cent. out of 301 operated cases reported up to the present, does not represent a large percentage and we believe that in reality it is larger, considering the seriousness and chronic character of the operated cases as well as the incomplete replies obtained in the following-up of the condition of the operated schizophrenics. Of the 9 cases of relapse, only three showed a perceptible improvement.

Of the total number of 339 standard leucotomies performed in this series, 10 patients died, which represents an operative mortality of 3 per cent. In only two of these cases was severe haemorrhage of the brain the direct cause of death. According to the total statistics of various authors, this complication in the form of post-operative haemorrhage is no rarer in the open method of leucotomy, under direct vision.

Summary.

In the course of the last 5 years, from 1947 till 1952, we performed altogether 339 standard prefrontal leucotomies and we have set forth the definite operative results for schizophrenias, operated on from 5 years ago till 4 months ago. An analysis of the results shows that prefrontal leucotomy is almost as satisfactory in different forms of schizophrenia as in cases of psychoneurosis, and without any significant differences in the recovery which might be in connection with the duration of the illness or with the age of the patient. The results are considerably better in the case of patients with a pre-operatively intact personality.

In the reported series of 301 schizophrenics operated upon the total of favourable operative results amounts to 63 per cent.; while the condition remained unchanged in 30 per cent., there were relapses in 3 per cent., operative mortality amounting to 3 per cent. This means that in this series of schizophrenics about two-thirds of the patients were able, after the operation, to leave hospital and live at home, socially rehabilitated. Of these two-thirds about one-half returned to their former occupation and to a normal life. These results represent a considerable social-economic success.

Finally we wish to express our thanks to the psychiatrists of the Neuropsychiatric Clinic of the State Mental Hospital in Belgrade for their professional collaboration in the assessment of the operative results achieved.

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SUXETHONIUM BROMIDE IN E.C.T.

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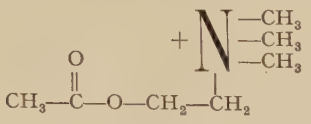
The use of muscle relaxants in E.C.T. constitutes an important advance in psychiatric practice. The merits of the method are not only due to the beneficial effects of the relaxant itself; the anaesthetic, that is invariably administered at the same time, plays an essential part in the procedure. Every phase of the treatment is greatly improved. Anxiety, which so often develops during unmodified E.C.T., is greatly reduced if not abolished altogether. There is no cry or other noise that might disturb other patients awaiting treatment; the convulsion is attenuated to a reaction that may be varied at will from a mild modified convulsion to a mere flicker of facial muscles or complete absence of muscular activity. Cyanosis is absent and the colour remains good throughout, and—perhaps most important of all from the therapeutic point of view—there is no restlessness or confusion after the treatment, the patient sleeping quietly after the treatment until he wakes up without any unpleasant sensations or memories.

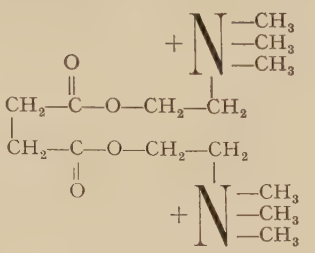
There were, however, certain demerits of the method when the older relaxants such as d-tubocurarine, decamethonium iodide and gallamine triethiodide were used. With most substances the administration of an antidote was required, and there was the danger of prolonged apnoea necessitating artificial respiration for long periods if the injection of the antidote for some reason or other, e.g., very poor veins, was unsuccessful. Other possible complications can arise from side effects of the antidote—usually prostigmine. These drawbacks have been entirely overcome by the introduction of the latest addition to the group, the succinylcholine compounds (1), (2), (3), (4).

So impressive was the effectiveness of these substances, the ease of their administration and the degree of safety and freedom from undesirable side effects that we discontinued entirely the use of other relaxants in E.C.T. and adopted one of these compounds for our routine procedure.

Succinylcholine is closely related to acetylcholine. They can be represented by the formulae :



Acetylcholine (cation).



Succinylcholine (cation).

Like decamethonium and unlike curare and true curarizing agents, the succinylcholine compounds belong to the group of depolarizing agents. They have an acetylcholine-like action on muscle-fibres which manifests itself in muscular twitchings up to *ca.* 30 seconds after the injection. They are broken down by plasma cholinesterase. No other antidote is known nor, indeed, necessary. Anticholinesterases such as prostigmin would only prolong the paralysing effect.

The succinylcholine compounds are eminently suitable for use in E.C.T. Their attenuating effect is of very short duration, and can easily be graded according to the wishes of the therapist and the circumstances obtaining in an individual case. Respiration usually returns very soon after the administration of the shock without further injection of an antidote.

Technique.

Two succinylcholine preparations were used : Brevidil M (the bromide of succinylcholine or suxamethonium bromide) and Brevidil E (the bromide of an ethyl-substituted succinylcholine or suxethonium bromide). Brevidil E proved to have a much shorter action than Brevidil M and was therefore more suitable for E.C.T. Brevidil E was finally adopted as the standard relaxant in all cases.

40–45 minutes before treatment atropine sulphate ($_1\frac{1}{0}\frac{1}{0}$ gr.) was given by hypodermic injection. As even intravenous injections of atropine take some time before they produce the desired effect there was no point in mixing the atropine with the relaxant and our previous practice of doing so was abandoned. The injection of Brevidil E was invariably combined with thiopentone sodium 0·2. gm. This is essential because the injection of Brevidil alone would cause most unpleasant sensations as the result of the painful muscular fibrillations and a feeling of suffocation due to respiratory paralysis (3). Although, according to the manufacturers, solutions of Brevidil are fairly rapidly inactivated in an alkaline medium, e.g., solutions of thiopentone sodium, we found that simultaneous injection of Brevidil and thiopentone sodium was as effective as separate injections. Both solutions were freshly prepared, mixed in the syringe and immediately injected into a vein. As soon as the twitchings had died down, i.e., at the time of maximum relaxation, a lubricated Phillips type

airway was introduced into the mouth. (The small side-tube had been removed altogether, and the rubber part had been pushed up to the top of the metal piece in order to prevent any possible injury to the teeth.) Then the electric shock or shocks were administered. In most of our cases a "Plexacon" as designed by MacPhail and Strauss was used. It was found that the convulsion threshold was quite considerably raised, which no doubt was due to the central anticonvulsant effect of thiopentone. More electricity in terms of joules or volt × time and/or a greater number of shocks were required to produce a definite reaction. When the attentuated reaction had come to an end artificial respiration was begun at once. This was carried out with the help of a face piece and re-breathing bag, the gas used being a mixture of 95 per cent. O_2 and 5 per cent. CO_2. The admixture of CO_2 was preferred in order to ensure that the CO_2 tension of the blood was not unduly lowered by hyperventilation. Spontaneous respiration returned usually within a minute or so of the termination of the convulsion; on only one occasion was it delayed for five minutes. The apnoea after Brevidil M is slightly longer, but with this substance, too, respiration returns usually within 4 minutes of the injection. The difference between Brevidil E and Brevidil M is, however, sufficiently marked to give the E compound a decided preference. With Brevidil E the whole treatment takes hardly longer than unmodified E.C.T., which is a point deserving some consideration when one is dealing with a long list. After the treatment the patients are turned on one side and placed in a comfortable position. They invariably pass into a restful sleep, from which they can be roused without difficulty, but as this period is probably beneficial they are allowed to sleep as long as practicable. 1½ hours after the treatment they have a full breakfast and out-patients are allowed to leave hospital in the company of a friend or relative.

The dose of relaxant varied with the degree of attenuation aimed at and the sensitivity of the patient, but there was no very close relationship to body weight. The initial dose was 60–80 mgm, as gauged on clinical appraisal of patient in the light of previous experience. The optimum dose was determined by trial and error and varied between 40 and 120 mgm. We never aimed at complete elimination of the muscular response, and there was never any difficulty in deciding whether there was a true reaction or only a stun. The most desirable degree of attenuation of both the initial jerk and the convulsion depended entirely on the physical condition of the patient. Although our doses were comparatively small the attenuation obtained was adequate, and we were able to treat many patients with physical conditions which would have made unmodified E.C.T. contra-indicated (e.g., gross deformity of the spine, pulmonary tuberculosis, osteo-arthritis of the spine, cardio-vascular disease, achondroplasia, old fractures sustained under unmodified E.C.T.).

Conclusions.

Well over 450 treatments have been carried out on 70 patients of both sexes, including a number of out-patients. The ages varied between 14 and 69. No untoward effects of the treatment, such as prolonged apnoea, have been

observed. On one occasion the return of spontaneous respiration was delayed for 5 minutes. (The cholinesterase level in this case was normal.) The psychiatric results of modified E.C.T. are at least as good as those of straight E.C.T. Patients who have undergone the treatment have not complained about unpleasant sensations, and they show less tendency to develop apprehension during the course of treatment. The method has been so successful that attenuation by Brevidil E has become our standard method. All patients having E.C.T. are given this modified treatment unless there are special reasons preventing it, such as very bad veins, or a very high convulsion threshold. Owing to the absence of undesirable sequelae the method was found particularly suitable for out-patients.

We wish to express our thanks to Dr. Duncan Macmillan, Physician Superintendent, for his interest, and to Messrs. May & Baker, Ltd., for trial supplies of Brevidil E and Brevidil M.

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"BREVIDIL M" AS A MUSCLE RELAXANT IN ELECTRO-SHOCK TREATMENT.

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As modification of electro-shock is becoming a routine procedure in every patient undergoing this therapy, it is necessary to find a muscle relaxant, or as it has been commonly called a "curarizing agent," which will be ideal for this purpose. Ideal should mean no toxicity, rapid onset, short duration and rapid termination of neuro-muscular blocking action.

Muscle relaxants in use at present form two groups according to their mode of action. Some of them, like D-tubocurarine, diminish the depolarising action of acetylcholine so that the amounts discharged are unable to evoke end-plate potentials sufficiently large for the excitation of muscle-fibre. Others like decamethonium iodide exert an action analogous to that of a large dose of acetylcholine. They cause a persistent depolarization accompanied by neuro-muscular block (Paton and Zaimis, 1950 ; W. Feldberg, 1951).

To the latter group belong the succimethonium salts or bis (2-dimethyl-aminoethyl) succinate bismethhalides, which were described for the first time by Hunt and Taveau in 1911. In 1949 Bovet and Bovet-Nitti described their pharmacodynamic properties, showing that they possess a fairly potent though short-lasting inhibitory action on myoneural junctions, that the substances are inactivated by cholinesterase, and that the inactivation is prevented by anti-cholinesterases (physostigmine, neostigmine).

Castillo and de Beer (1950) in their experiments on animals found that a rapid intravenous injection of 0·2 mgm./kgm. body-weight of succimethonium iodide caused a short-lasting paralysis of the muscles of the head, neck and extremities in rabbits, but had no paralysing effect on respiration. Their further experiments on anaesthetized cats and dogs showed that the drug had an insignificant effect on blood pressure, its blocking action was considerably prolonged by the previous injection of physostigmine, and that 0·25 mgm. of succimethonium iodide was inactivated *in vitro* by 1 ml. of cats serum during an 18-hour incubation period.

From clinical investigations on man when the drug was used for muscular relaxation in about 30 laparotomies and over 500 electro-shocks (Thesleff, 1951 ; Holmberg and Thesleff, 1951) it has been found that the neuromuscular blocking action of succimethonium iodide starts almost immediately after intravenous injection and lasts from 1–6 minutes according to the dose.

With a dose of 0·1–0·2 mgm./kgm. body weight muscular paralysis first affects eye and throat muscles, then peripheral musculature, leaving respiration

almost unaffected, and only larger doses (0·4–0·6 mgm./kgm.) bring about respiratory paralysis. Even these comparatively large doses have never had any significant effect on the circulation, beyond a small and brief rise in blood-pressure and some bradycardia, and there have been no post-operative complications which could be attributed to the drug.

One of the succimethonium salts was presented for clinical investigation in this country a year ago and has subsequently appeared on the market under the designation " Brevidil M," which a is brand of succimethonium bromide or bis (2-dimethylaminoethyl)-succinate bismethobromide.

I have used " Brevidil M " as a muscle relaxant in electro-shock therapy for various mental disorders in 116 patients, both men and women, giving altogether 472 electro-shocks. The age of the patients ranged from 17 to 76 years. Some of them—mostly elderly people—were very debilitated and had considerable hypertension.

The effect of the action of " Brevidil M " was carefully observed in the first 42 patients, who received altogether 120 treatments. The pulse and blood-pressure were taken before the injection of " Brevidil M " and immediately afterwards.

The following method of administration is used : The patients have a light breakfast and the treatment is carried out about 2 hours later. A subcutaneous injection of atropine sulphate $\frac{1}{100}$ gr. is given 30-40 minutes before treatment. In the treatment room the patient receives an intravenous injection of freshly prepared solution containing 2 mgm./stone body-weight (0·3 mgm./kgm.) of " Brevidil M " mixed immediately before the injection in the same syringe with 3·5 cc. of 5 per cent. solution of soluble thiopentone. The injection is given comparatively slowly (30 seconds), and about 30 seconds after the completion of the injection the electro-shock is induced. From the beginning of the injection till the induction of the shock the patient is given oxygen by means of a mask. After the shock is over the oxygen is given again until the return of normal respiration.

Results.

About 30 seconds after the beginning of the injection delicate and short-lasting muscular fibrillation appears.

In all cases the pulse remains full and regular after injection, but slows by 10–20 beats per minute.

The blood-pressure in 35 patients was slightly raised (5–20 mm.) ; in 7 patients it remained unchanged.

It was found during the fit that with a dose of 2 mgm./stone (*a*) in 33 patients there were no muscular movements except blinking of eyelids, clonic twitchings of facial muscles and contractions of arrectores pilorum (goose-flesh) (*b*) in 7 patients, besides blinking of eyelids, twitchings of the facial muscles and contraction of arrectores pilorum, there were clonic movements of the upper and lower limbs, but in all these cases the muscles remained flaccid, and flexion of the spine was never noticed. In only 3 patients had the dose to be increased to 2·4 mgm./stone (0·35 mgm./kgm.) in order to reach muscle relaxation as

described at (*b*). In the other 2 cases (an old woman of 76 and another women who was fairly stout) muscular relaxation as at (*a*) was obtained with a dose of 1·4 mgm./stone (0·2 mgm./kgm.).

In 90 per cent. of the cases spontaneous breathing returned almost at once after the fit and regular respiration was established within a minute of the end of the shock. In the remaining 10 per cent. return to normal breathing was never delayed beyond 2 minutes. When the patient's breathing became regular he did not require further active attention other than that normally provided after electro-shock.

A fleeting erythema on the neck and the upper chest persisting for about 30 minutes after the injections was noticed in 6 patients, salivation was found to be fairly profuse in one of them, and in 2 of the patients a mild hiccup occured which passed off in a few minutes.

In the remaining 72 patients two different methods were applied. In some of them, after the premedication with $\frac{1}{100}$ gr. of atropine sulphate, 3 c.c. of 5 per cent. soluble thiopentone was given intravenously, followed by the injection through the same needle of freshly prepared solution of "Brevidil M," which was injected rapidly, and 20 seconds later the electro-shock was induced.

Others were given $\frac{1}{200}$ gr. of atropine sulphate and $\frac{1}{200}$ gr. of hyoscine hydrobromide as a premedication; about half an hour later "Brevidil M" was given by rapid intravenous injection and after 20 seconds the electro-shock was induced.

In neither of these two methods was oxygen used till after the shock was over.

The dose of "Brevidil M" used was a constant one—15 mgm. in man and 12 mgm. in women—and only in exceptionally large and muscular persons did it have to be increased by 2–3 mgm.

The results were exactly the same as those produced in the first 42 patients. It has only to be stressed that the patients prefer to be given E.C.T. under this light anaesthesia (thiopentone), because of the unpleasant feeling of apprehension which they otherwise experience after the injection of "Brevidil M."

In all cases in which soluble thiopentone was given, this comparatively small dose of 0·15 gm. (3 c.c. of 5 per cent. solution) was sufficient to prevent the patients from having any unpleasant recollection afterwards.

Conclusions and Summary.

"Brevidil M" was given to 116 patients, both men and women, as a muscle relaxant in E.C.T.

In 42 patients atropine sulphate was used as a premedication to prevent the usual parasympathetic stimulation associated with E.C.T. The average dose of "Brevidil M" was 2 mgm./stone (0·3 mgm./kgm.), giving in a majority of cases complete muscular relaxation, and in only 3 cases had this to be increased to 2·4 mgm./stone (0·35 mgm./kgm.) in order to achieve sufficient modification of the fit.

In 72 patients different methods were applied; in some of them soluble thiopentone and "Brevidil M" were given by two syringes after the premedication with $\frac{1}{100}$ gr. of atropine sulphate; others had "Brevidil M" injected

without thiopentone, and in these cases $\frac{1}{200}$ gr. of atropine and $\frac{1}{200}$ gr. of hyoscine were used as premedication. The dose of "Brevidil M" was constant, 15 mgm. in men, 12 mgm. in women.

The results achieved are very encouraging. The action of the drug on the circulation is insignificant. No side-effects which would need intervention were noticed.

The drug has a constant and certain action, gives the desired degree of muscular relaxation, even when it has been mixed with soluble thiopentone in the same syringe, and spares respiration; its action ceases soon after the shock is over.

To a large extent it can be mixed with thiopentone in the same syringe, although this should be done immediatley before the injection.

Because of the rapid onset, brief duration and rapid termination of neuromuscular blocking action, and because of its safety, "Brevedil M" seems to be ideal as a muscle relaxant in E.C.T. The fact that it is cheap is also not unimportant.

I wish to acknowledge my thanks to Dr. T. W. Davidson, Dr. C. E. H. Turner and Dr. R. W. Lennon for their interest in this work.

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FURTHER OBSERVATIONS ON THE EFFECTS OF LYSERGIC ACID DIETHYLAMIDE.

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In previous communications (1951, 1952) we have shown that lysergic acid diethylamide (LSD-25), a drug which has a remarkable psychological effect in minute oral doses, also has an effect on carbohydrate metabolism resulting in an increased concentration of hexosemonophosphate in the blood. This observation has been confirmed by Cornforth and Long (1952). What was less clear from the experiments in mentally healthy subjects was the relation in time and severity between the psychological symptoms and biochemical changes.

In order to approach this problem, it seemed desirable to repeat our experiments in a group of schizophrenic patients. It has been known that these patients have a considerably greater tolerance of LSD-25, and may show only minimal psychological symptoms after the usual oral dose. We have, in fact, given up to 180 microgrammes to one semistuporose catatonic patient, injecting the substance intramuscularly and intravenously, without any effect on the mental state. Blood analyses were not made in this case.

Experimental.

In a series of 13 cases of schizophrenia of recent onset, we observed the effect of the drug on the patients' behaviour and on the blood level of hexosemonophosphate.

80 microgrammes of LSD-25 was given orally, the subject being fasting and kept in bed throughout the period of the observation. Blood samples were obtained before the administration of the drug and at intervals of one and two hours thereafter while the psychological state was observed. In one case (No. 13) the experiment was repeated because of the excessive excitement of the patient and the atypical biochemical finding. Control observations in which water was subsituted for the LSD-25 were made in 9 cases of the same series.

The results of these observations are set out in Table I. The psychological effects were slight. No sensory abnormalities were found, except in one patient, and the general behaviour of the patients was little changed. Blood analyses for hexosemonophosphate showed that, while there was a wide individual variation in the results, when receiving the drug there was a mean rise of 1·46

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TABLE I.—*To show the Effect of LSD-25* (0·08 *mgm. orally*) *on the Concentration of Blood Hexosemonophosphate and on the Psychological State of* 13 *Schizophrenics* (*one patient tested twice*).

Patient No.	Mental state at time of test.	Maximum Rise (+) or fall (−) Hexosemonophosphate (mgm./100 ml.)		Psychological effect of LSD-25 (0·08 mgm. by mouth).
		After LSD-25.	Control.	
1. D—	Apathetic, marked disturbance of thinking, delusional	+1·4	..	No change, but for slight and transient cheerfulness and laughing.
2. P—	Third relapse of catatonic schizophrenia with outbursts of violence	+2·0	..	No change.
3. K—	Mannerisms, thought disorder, hallucinated, co-operative	+3·4	..	Ditto.
4. C—	Paranoid, affective blunting, feeling of unreality, some insight	+1·7	−2·2	Feeling of elation and happiness.
5. McI—	Perplexity, thought disorder, emotional incongruity	+0·9	−4·1	Feels contented, happier than usual.
6. B—	Hallucinated, callous in feeling, thought disorder	+2·1	+3·2	Giggly and cheerful, restless and euphoric.
7. McC—	Indifferent, paranoid, marked deterioration	+1·0	−2·6	More alive and alert than usual, cheerful and friendly.
8. W—	Paranoid schizophrenia with marked affective admixture, now hypomanic	+3·7	..	Excessively cheerful and hyperactive, more so than usual; hilarious.
9T—	Schizophrenia with many hysterical features	+4·5	−3·0	Sensation of "queerness" in head; saw something "red" on the ceiling, the room rotating for a short time.
10. O'K—	Affective blunting, volitional disorder, lassitude	+8·0	−0·4	No change.
11. M—	Hypochondriacal delusions, mannerisms, depersonalization	−1·7	−0·1	Ditto.
12. St—	Hallucinated, paranoid ideas, outbursts of panic	+1·6	−0·3	Feels happier than usual.
13*a*. Sk—	Chronic catatonic schizophrenia, negativistic, aggressive	−5·6	−1·0	Outbursts of anger, resistant and abusive.
13*b*. Sk—	As above	−2·6	..	No change.
Mean		+1·46	−1·17	

mgm./100 ml. while under control conditions there was a mean fall of 1·17 mgm./100 ml.

In view of the marked similarity in the psychological symptoms of *mescaline* and LSD-25, a parallel series of observations of the influence of the former drug on the blood chemistry in mentally healthy subjects was carried out. The subjects were nine members of the staff.

The conditions were identical to those in the experiments with LSD-25; the subjects were fasting, resting and blood samples were obtained before and

at intervals of one and two hours after the administration of the drug. This was by intramuscular injection of 0·3 gm. mescaline hydrochloride.

The following analyses were made on the blood samples: glucose, hexosemonophosphate, alkali reserve, lactic acid, pyruvic acid, inorganic phosphate, total acid-soluble phosphate, lipoid phosphate and adenosine triphosphate, the methods being those reported in a previous communication (1951). No significant variation could be detected in any of these analyses. Table II

TABLE II.—*To show the Effect of the Intramuscular Injection of* 0·3 *gm. Mescaline Hydrochloride on the Concentration of Blood Hexosemonophosphate and the Psychological State of Normal Subjects.*

No.	Rise (+) or fall (−) in blood hexosemonophosphate after one hour (mgm./100 ml.).	Psychological effect.
1	+0·3	Nausea, perspiration, blushing, apathy, euphoria, visual illusions and hallucinations.
2	−0·8	Vegetative symptoms, apprehensiveness, depersonalization, visual phenomena.
3	+0·5	Hallucinations of smell and vision, mild euphoria.
4	+1·1	Nausea, visual illusions, derealization, feeling of intoxication.
5	+0·5	Only slight symptoms, difficulty in concentration.
6	−2·8	Disturbance of body image, illusions and hallucinations much later in the afternoon.
7	−4·0	Emotional disturbance, visual illusions, change of time sense, slightly paranoid.
8	−1·1	Marked vegetative symptoms, illusions and visual hallucinations. Laughing and crying.
9	−1·8	Lively imagery, feeling of cold, tenseness, nausea.
Mean	−0·9	

shows the variation in the blood hexosemonophosphate together with a short characterization of the subjects' psychological state. It will be seen that there is a mean fall of 0·9 mgm./100 ml., which is of the same order as that occurring under control conditions in the LSD-25 experiments. At the same time the psychological effect of the mescaline was very marked. Despite the similarity in the psychological effect of the two drugs there was no parallel biochemical effect.

In vitro Experiments.

Some effects of lysergic acid diethylamide upon the metabolism of isolated tissues have been studied using the brain and liver of the guinea-pig. The animals were killed by a sharp blow on the base of the skull and the tissues dissected and weighed as rapidly as possible. Homogenious breis were prepared in known volumes of Krebs fluid containing 0·2 gm./100 ml. dextrose.

The respiration of these preparations was studied in the Warburg apparatus with and without the addition of 0·125 μg./100 ml. lysergic acid diethylamide to the substrate.

In another series of experiments observations were made on the effect of tissue metabolism on the concentration of hexosemonophosphate, with and

without a similar quantity of LSD-25. Samples of the brei were analysed for hexosemonophosphate before and after incubation in the apparatus.

The results of these two series of experiments are set out in Tables III and IV. In Table III it may be seen that the hourly rate of oxygen respiration

TABLE III.—*To show the Effect of LSD-25 upon the Rate of Respiration of Brain and Liver Brei.*

Substrate.	Tissue. Brain. Krebs solution +0·2% dextrose.	Brain. Krebs solution +0·2% dextrose +LSD-25 (0·125 μg./100 ml.).	Liver. Krebs solution +0·2% dextrose.	Liver. Krebs solution +0·2% dextrose +LSD-25 (0·125 μg./100 ml.).
Oxygen uptake (c.mm./100 mgm.) wet tissue/hr.	63·3	78·1	42·8	38·9
	61·8	87·1	54·4	51·8
	69·3	84·0	47·9	44·3
	58·7	63·1	26·1	19·5
	43·8	69·3	34·0	32·8
Mean	59·4	76·3	41·0	37·5
Effect of LSD	..	+29%	..	−8·5%

of brain was raised from 59·4 c.mm./100 mgm. to 76·3 c.mm./100 mgm. by the presence of LSD-25 in the substrate. In the case of liver the hourly rate of oxygen respiration was reduced from 41·0 c.mm./100 mgm. to 37·5 c.mm./100 mgm., a rise of 29 per cent. and a fall of 8·5 per cent. respectively. Table IV shows that after respiration in the Warburg apparatus for a period

TABLE IV.—*To show the Effect of LSD-25 upon the Concentration of Hexosemonophosphate in Brain and Liver Brei after Incubation.*

Substrate.	Tissue. Brain. Krebs solution +0·2% dextrose (before incubation).	Brain. Krebs solution +0·2% dextrose (after 1 hour).	Brain. Krebs solution +0·2% dextrose +LSD (0·125 μg./100 ml.) (after 1 hour).	Liver. Krebs solution +0·2% dextrose (before incubation).	Liver. Krebs solution +0·2% dextrose (after 1 hour).	Liver. Krebs solution +0·2% dextrose +LSD-25 (0·125 μg./100 ml.) (after 1 hour).
Hexosemonophosphate in mgm./100 mgm. wet tissue	0·124	0·064	0·082	0·168	0·080	0·108
	0·193	0·066	0·089	0·139	0·098	0·118
	0·086	0·056	0·087	0·144	0·091	0·074
	0·094	0·069	0·081	0·220	0·069	0·099
	0·054	0·032	0·058	0·143	0·087	0·112
Mean	0·110	0·057	0·078	0·163	0·089	0·102
Percentage of concentration before incubation	100	52	71	100	55	63

of one hour the hexosemonophosphate content of brain fell to 52 per cent. of its original value, but that in the presence of LSD-25 the fall was to only 71 per cent. of its original value. In the case of liver the corresponding figures were 55 per cent. and 63 per cent.

Discussion.

If one tries to relate the results of the *in vitro* experiments to those *in vivo*, the sparing effect of LSD-25 on hexosemonophosphate metabolism is established. It is also suggested that this sparing effect is greater in brain tissue than, e.g., in liver. At the same time it would appear that the drug stimulates respiration of brain. It seems justifiable to relate these chemical changes in metabolism to the psychological symptoms of the drug.

On the other hand, attempts to establish the mechanism of the psychological changes by the use of (*a*) LSD-25 in schizophrenics with little change of behaviour and (*b*) mescaline in normals with marked symptoms have failed. Characteristic variations in blood chemistry were found in (*a*) whilst being absent in (*b*).

Further investigations of LSD-25 in specific enzyme systems seem to be indicated.

Summary.

1. Lysergic acid diethylamide was given to 13 schizophrenic patients. Psychological effects were minimal, but an increase of blood hexosemonophosphate was observed.

2. Mescaline hydrochloride given to normal subjects produced marked psychological symptoms similar to those of LSD-25. No changes in blood chemistry were observed.

3. Manometric experiments with tissue brei showed that LSD-25 stimulated the respiration of brain tissue.

4. In similar experiments LSD-25 had a sparing effect upon the metabolism of hexosemonophosphate.

We wish to thank the patients and staff of the hospital who were concerned in these experiments for their co-operation, and to express our gratitude to Dr. P. K. McCowan, Physician Superintendent of Crichton Royal, Dumfries.

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A SMALL EXPERIMENT IN THE USE OF ACETYLCHOLINE IN THE TREATMENT OF NEUROSIS.*

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Assistant Psychiatrist, St. George's Hospital, Hornchurch, Essex.

The purpose of this experiment has been, in the first place, to bring about improvement in certain patients who were responding insufficiently or not at all to psychotherapy, by the use of this drug for which claims have been made that it is of value in the therapy of some anxiety states, such as those characterized by tension ; and in the second place to gain by experience an understanding of how much we are justified in expecting from its use. Within the limited series of eleven patients so far treated, results have been sufficiently encouraging to make us wish to continue.

Acetylcholine produces parasympathetic overactivity, and if large doses are used the action of the heart is arrested. In small doses it lowers the blood-pressure by a direct dilator action on the walls of certain peripheral blood-vessels. After atropine, small doses no longer depress the heart or the blood pressure (Wright, 1945). Very rapidly the acetylcholine that has been injected is inactivated by its esterase and the heart action allowed to recommence. Immediately after the injection the patient feels acutely ill, the pulse slows and he coughs and splutters. With larger doses the pulse stops and there is a brief loss of consciousness ; and I have learned not to feel undue concern if the patient is pulseless for 25 seconds. The face is usually red and congested during the coughing stage and this is followed by pallor. Within a minute or two all is over and the patient is able to get up and walk away, although some are pale and may feel faint for a short time afterwards,

Professor Lopez-Ibor (1952) says that he has found this drug useful in treating what he calls " biological " or " vital " anxiety states, such as are characterized by restlessness, dread, apprehension, cardiac dysfunction, dizziness and the like. These he considers are not amenable to psychotherapy but can be treated by drugs, while psychotherapy is of supportive value. He considers E.C.T. unsuitable as a remedy for them and favours acetylcholine. Sargant (1952), believes that the ailments most likely to derive benefit from acetylcholine are mildly obsessional states with tension, especially in patients of pyknic or athletic physique, and cases of anxiety with regard to one particular topic.

Case 1 was a man of 48, a telegraph operator, married with no children, who had been anxious for years. Anxiety seemed to be related especially to his work and other symptoms were indecision, fidgeting, obsessional necessity to check things

* Read at a Divisional Meeting of the R.M.P.A., April 21, 1953.

over and over again, want of confidence, panics, hiccough after meals and occasional flatulence. After the outlines of his illness had been sketched in a few interviews he was given a course of 22 acetylcholine injections in thirty days. This, however, made no substantial alteration in his condition. He did, indeed, say spontaneously that he thought the medicine had helped him and added, " This four weeks have done me a world of good," but I myself was not impressed. His illness had at first appeared very much the sort that had been described as likely to respond to acetylcholine, but in reality was a hysterical neurosis and therefore unsuitable.

Case 2 was that of a lady, 32 years old, who suffered from an obsessional type of anxiety state characterized by a compulsive need to pick up broken glass, to put straight any accidental damage or to relieve any distress she might discover. She was terrified lest she should see some accident, even a trivial one, about which she could do nothing. If the compulsion were frustrated she would have feelings of tension, dyspnoea or of being " overwhelmed." There was also a considerable element of marital difficulty for which the patient was not primarily responsible. There were no children. Her illness proved to be amenable to psychotherapy and to the social therapy of a neurosis unit, so that after a series of just under 50 psychotherapeutic sessions she has been able to make major adjustments in her domestic situation and is reasonably well and doing a useful job of work. In the middle however, of this treatment I wondered if we could help her to deal with some of her immediate anxiety and feeling of tension, at that time considerable, by a series of acetylcholine injections. Of these, she had ten in fifteen days, and at the end of this time she felt she had been helped by the injections, although she was so terrified by the feelings of acute distress that each induced that she could not allow me to continue the treatment. In this case it seems that acetylcholine was of value in helping to tide the patient over a difficult time, while psychological treatment was still under weigh.

Case 3 is similar to the last in that the main treatment was psychotherapeutic, and in other respects. A married lady of 21 suffered severe distress from a phobia of insects, and in the end a satisfactory result was achieved after a series of 100 psychotherapeutic interviews, even if the case is too recent to allow a cure to be claimed. There came a time, towards the end of the series of interviews, in mid-summer when insects were numerous, when she experienced excessive anxiety and distress, so that I felt forced to seek for some adjuvant. Under these circumstances resort was had to acetylcholine, and this patient received 9 injections in 66 days. Once again the injections had to be stopped on account of the apprehension to which they gave rise ; yet they seemed to have done good, and I was sufficiently pleased with this to feel that I would take similar action if similar circumstances were to arise in the case of some other patient.

Case 4.—This was an intelligent young man, aged 28, of good character and pleasant disposition, many of whose symptoms were of a phobic nature. Since the age of 14 he had suffered from bilious attacks. When he came for treatment at the end of 1951 he complained of claustrophobic attacks in crowds, and especially in buses or trains, of sleeping poorly (getting off to sleep all right but waking at 2.30 or 3.0 a.m. and then dozing till morning), and of having been unable to go to work recently because he could not face the travelling. There had been a recent phase, lasting about 3 weeks, in which he said he did not know what to do with himself if left alone, had walked about the house feeling intensely lonely and had cried two or three times a day. He had a periodic sensation of weakness in his limbs, numbness in his palate and other symptoms. It may be that an element of endogenous depression existed here and that E.C.T. would have produced results, but I have a strong reluctance to use E.C.T. until I am sure that it is the treatment of choice, and in this instance I concentrated on a psychotherapeutic approach throughout. From this he gained not a little, but in the middle of it he was feeling " tense and keyed-up," apprehensive and depressed, and I, therefore, gave him a series of 9 acetylcholine injections. These unfortunately enhanced his symptoms and for this reason I discontinued them. This is the only case in which the acetylcholine definitely made the patient temporarily worse. Psychotherapy was continued and a satisfactory result obtained.

Case 5.—This 28-year-old man complained of excessive shyness, which had prevented his forming any attachment to members of the other sex, and also of tinnitus, paraesthesiae of the face, loss of interest in his job, difficulty in getting to sleep at night and mild depression. As a child he was afraid of the dark ; in the army he

suffered from headaches and other symptoms; his present symptoms had existed for several years. A matrix intelligence test gave a low average result; unfortunately his principal occupational interest was in nuclear physics. On account of his depression he had already been treated by E.C.T. and desoxycorticosterone with little benefit. Psychotherapy appeared unpromising in his case, but he did gain something from the social therapy of our neurosis centre (which had not been opened at the time when he was given the electrical treatment). Here he was given five injections of acetylcholine, but the attempt had to be given up as he was so afraid of the immediate reaction.

Case 6.—A man of 37 complained that during the past year he had been acutely irritable, wanted to cry, wanted to be on his own, felt jumpy inside, was obsessed by fears and by the names of those of his friends who had died, and was absent minded so that he would, for instance, go to make tea but actually do something "silly" instead. He was tense and agitated. He was treated by psychotherapy, E.C.T. and methedrine injections, to none of which he made a good response, and I then decided to try him with a course of injections of acetylcholine. He had only 13 injections but the improvement in his condition was rapid, appreciable and sustained. It is necessary to add that there were one or two features of this case which gave rise to a suspicion of possible underlying psychosis, but they can be disregarded for the present.

Case 7.—This was a 24-year-old, married lady who had a severe claustrophobia, at times amounting to numerous bad panics in the course of one day and giving rise to thoughts of suicide. She had had a good deal of treatment before she came to us and I decided to see what acetylcholine could do for her. She had 12 injections but they did not do the slightest good, and as she was seriously anxious and phobic I resorted to intensive E.C.T., which produced a limited degree of amelioration.

Case 8 was a man aged 39 who had a chronic neurosis, in which he at times felt depressed, and whose wife found him almost impossible to live with. He had been treated in the army by in-patient E.C.T. with short-lived improvement, had come to my clinic a number of times the previous year at his wife's instigation and now came referred by the Ministry of Pensions. In an attitude of experiment—because no known remedy seemed likely to do him much good— I used acetylcholine. He attended as an out-patient for seven injections and then, without giving any reason, he ceased his attendances. (Recently, his wife having left him, he has come to me in a more co-operative frame of mind and there appear to be psychotherapeutic possiblities.)

Case 9 is that of a hysterical, married man of 46 whose insecure personality seemed to provide a poor foundation for psychotherapy. Acetylcholine represented a shot in the dark in the hope of providing a greater degree of inner contentment. The 23 injections he received appeared to have some suggestive value in alleviating his symptoms but no specific effect was noticeable.

Case 10, a lady aged 28, with a known tuberculous lesion of the lung, had been admitted to the neurosis centre with a hysterical type of depression. A nervous breakdown had occurred on Service six years previously, and during the present illness she had already been treated by psychotherapy, including ether abreaction, sedation, modified insulin and E.C.T., to say nothing of the social therapy of the unit, which did produce a little alleviation while its influence operated; and it was after all this that I decided to give acetylcholine. She had nine injections, some of them producing a severe immediate reaction, but did not improve.

Case 11, is in a somewhat different category from the others, but is of interest because of the lesson his treatment taught me. He was a man of 41 who came for treatment in a state of acute anxiety, but who early showed psychotic symptoms, which I eventually felt justified in regarding as being schizophrenic. Fiamberti (1950) in a lengthy paper has claimed good results from acetylcholine in treating schizophrenics using large doses of 0·5 gm., and he says that in over 50,000 injections he has had no fatalities from the drug. It seemed that the patient in question was the sort who should be likely to benefit and I worked up to this large dose with him. An interesting feature of his case was the occurence of acute epigastric or precardial pain after each injection, attributed to over-stimulation of the parasympathetic splanchnic nerves. After his 30th injection he began to revive, and then suddenly collapsed so completely that death seemed imminent. He recovered quickly after an intra-cardiac injection of adrenaline. This experience led me to decide that 0·4 gm. should in future be an absolute maximum dosage.

The method I am using is to begin with a dose of 0·06 or 0·08 gm. in about 1 c.c. of water and to inject this *rapidly* into a vien. Subsequently the dosage is stepped up a little each time until perhaps 0·2 gm. is reached. Anything above 0·25 is probably in the realm in which caution is necessary, although some patients easily tolerate more than this, in some cases up to 0·4 gm. I have come to like the minimum dose which will produce unconsciousness. Because of the severe discomfort that some patients feel I have begun to experiment in giving seconal, 1½ gr., beforehand. This has been helpful. but in one case under treatment at present and not included in this paper I have been forced to give pentothal, just sufficient to produce unconsciousness, injecting the acetylcholine from a second syringe immediately afterwards. As antidotes in case of emergency I have on the tray adrenaline, coramine and atropine, and a long needle is included just in case an intra-cardiac injection should be required.

The number of patients in this series is much too small to provide an indication as to what sort of clinical syndrome is likely to benefit from acetylcholine. In Cases 2, 3 and 6 we seemed to have gained something, and this suggests that it is likely to prove its value at least occasionally.

Summary.

It has been claimed that acetylcholine is of value in the treatment of anxiety states, mainly those showing certain characteristics. Of 11 patients thus treated 3 appeared to gain appreciable benefit. Acetylcholine has unpleasant side-effects but these are short-lived, while large doses may be dangerous. The total impression made by this trial is that it will be worth while to continue using this new remedy in selected cases.

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Part II.—Reviews

The Neurophysiological Basis of Mind. By J. C. Eccles. Oxford: The Clarendon Press, 1953. Figs. 89; pp. 314. 25*s*.

The book is an amplified version of eight lectures (the "Waynflete") delivered at Oxford last year. Professor Eccles has reviewed and amplified the lectures and has given the book the sub-title, "The Principles of Neurophysiology." As a survey of these principles the book can be unhesitatingly recommended. Matter, printing, binding and illustrations are all excellent.

Its eight chapters deal with ionic agents at the cellular membranes, both when resting and active, with synaptic transmission, central inhibition, the transmission of information, plasticity in the nervous system (as a basis of "memory"), and, finally, the cerebral cortex and the "mind-brain problem" (*sic*). The first six chapters, based almost entirely on studies of the peripheral nerve and spinal cord, are as good as present-day neurophysiology can make them. The last two chapters, however,—those on the cortex and its highest functions—fall off sadly, as so often happens when those who have spent much time studying the *minutiae* of the nervous system begin to consider its action as a whole; yet it is difficult to see, while present-day neurophysiology is limited to the study of the finest details in an organism carefully isolated from its environment, how the neurophysiologist's account could have been improved. The last two chapters, in fact, show only too clearly how ill adapted classical neurophysiology is to undertake the study of the brain's highest functions. At the moment it is far too concerned with details, and its technical resources are leading it only into the ever smaller. As a result, the neurophysiologist who starts to examine the highest functions is like a microscopist who, hearing that there are galaxies to be looked at, has no better resource than to point his microscope at the sky. He must not be surprised if he sees only a blur.

W. Ross Ashby.

A Text-book of Medical Psychology. By Ernst Kretschmer. Translated, with an Introduction by E. B. Strauss. London: The Hogarth Press, 1952. 30*s*.

It is to the credit of Dr. E. B. Strauss who translated the 4th edition in 1934 and introduced Kretschmer's *Medical Psychology* to the English-speaking practitioner, that this book and its comprehensive and undogmatic attitude is familiar to psychiatrists in this country. The present 2nd edition in English corresponds to the 10th German edition. Its basic views are entirely unchanged. For any reader who wants an introduction to psychopathology, or an unsystematic framework for his knowledge in this field, Kretschmer's open and adaptable approach should be welcome. He has been attacked for superficial brilliancy of his writings, for lack of precision in his methods and for the inadequacy of penetration into the subject-matters under discussion. If all this is conceded, one still feels behind the absorbing and original writer the clinician of the highest standing and great experience. Hence the suitability of this book, not only for the expert in search of an independent point of view, but also, as the translator points out, for the medical student and for the ancillary workers in psychiatry.

W. Mayer-Gross.

Progress in Neurology and Psychiatry, Volume VII. Edited by E. A. Spiegel, M.D. London: George Allen & Unwin, Ltd., 1952. Pp. 604. Price 70*s.*

This volume maintains the high standard set in the previous six volumes. The book is divided into four sections dealing with basic sciences, neurology, neurosurgery and psychiatry.

A brief account has been added by Sjögren and Hallgren on genetics in neurology and psychiatry, including a brief section on research in twins.

It is interesting to read in the excellent chapter on psychosurgery by Freeman and Watts, that psychosurgery has been banned in the Soviet Union by decree of the Ministry of Health as contradicting fundamental Pavlovian concepts. It is also interesting that Jugoslavia and Czechoslovakia both still employ prefrontal lobotomy! The position in the rest of the world with regard to techniques, etc., is obviously still very fluid, and it will be many years before the position will become stable.

One of the best chapters is that dealing with the pharmacology of the nervous system. This important aspect of neurology and more important still of psychiatry is rapidly becoming a very complicated and difficult subject, but one on which the clinician must keep himself fully informed.

G. W. T. H. Fleming.

Chronic Alcholism Brookside Monograph No. 1. By R. J. Gibbins. Toronto: The University Press, 1953. Pp. 57.

This is a competent and readable account of the present position of chronic alcoholism. The writer points out that most psychological theorists ignore the reasons for drinking alcohol, and for drinking to excess. Tolerance is one of the most important factors to be considered. A high gastric intolerance may save a person from addiction, but a high psychological tolerance may encourage it.

The relation of poverty to alcoholism is not quite so simple as it appears. It used to be considered a factor, but modern investigation has shown that during times of industrial depression there is much less alcoholism, and that the more prosperous levels of the population are just as much addicted to alcohol as are the less prosperous.

It is interesting to read that there are no less than twenty methods of treatment! The writer discusses these in reasonable detail, and in discussing the results from Alcoholics Anonymous points out that the high percentage of cures claimed by A. A. is somewhat due to the fact that the group submitting itself for treatment by A. A. is in the first place a higher selected group, i.e., unlike most alcoholics they have a genuine desire to co-operate and recover, and have religious or spiritual feelings which help them enormously as part of their group therapy. It is of course a most economic therapy.

There is only one answer to alcoholism, and that is the strength of will to be a total abstainer for life!

G. W. T. H. Fleming.

Annual Review of Psychology. Vol. 4. Edited by C. P. Stone and D. W. Taylor. Stanford, California: Annual Reviews Inc., 1953. Price 50*s.*

The fourth volume of this series has maintained the high standard set in the previous three volumes. The ground covered is much the same, but comparative and physiological psychology have been given separate chapters, which is an improvement. A final chapter on theoretical psychology has been added, dealing with what the writer (G. Bergmann) calls the logic of psychology; this is one of the best chapters in the book.

The chapter by White on abnormalities of behaviour will appeal to our readers most strongly, though there is not a lot in it that the conscientious reader of the literature is unaware of, but it is nevertheless a good summary of the position as it existed in the beginning of 1952, and the writer utters a timely word of caution to those who are inclined blindly to accept biochemical theories as an explanation of every departure from normal behaviour.

G. W. T. H. Fleming.

Clinical Psychiatry. By Ian Skottowe. "The Practitioner" Series. London: Eyre & Spottiswode Ltd., 1953. Pp. 395. Price 36*s*.

This is a good book for the practitioner and for the student. It is a well-written and interesting presentation of clinical psychiatry from the psycho-biological or Meyerian viewpoint. The biological outlook on psychiatry owes a great deal to Adolf Meyer.

It is full of the common sense which one has learnt to expect from the writer. It is a relief to see in print the statement that it is unwise for a doctor to say that a patient needs a certain form of treatment. If doctors would leave the form and duration of treatment to the mental hospital psychiatrist a great deal of trouble would be avoided; so often one hears the story that the patient has been told that three weeks in hospital and a few shocks and they will be fully recovered.

How true is the author's remark that occupational therapy should always be judged by its effect on the patient and not by the excellence of the articles that he makes or the work that he does. When general under-development of the cardio-vascular system is mentioned as a finding in schizophrenia it would have been wise to mention the "small heart" which is so frequently found post-mortem. We wonder if all the psychosomatic experts would agree with the statement that there is no such thing as "hysterical or at least psychogenic pyrexia." It is pleasing to the reviewer to see pointed out that the word amentia is better avoided, as it refers to confusional insanity on the continent of Europe, and to see the word oligophrenia freely used.

Altogether a most satisfying and agreeable book and a worthy product of British psychiatry.

G. W. T. H. Fleming.

Physiology of Vision. British Medical Bulletin, vol. 9, No. 1. The British Council, 1953. Pp. 83. Price 15*s*.

Thirteen authors, each an authority in his field, give reviews of various aspects of the subject. Articles, printing and illustrations are all excellent, and I need say no more than that it sustains the high standard set by the series' previous numbers.

W. Ross Ashby.

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Pharmacology of Drugs Affecting Skeletal Muscles.

Acetylcholine has been recognized as the chemical transmitter at the neuromuscular junction and at ganglia in the sympathetic nervous system, and it probably has the same function as the transmitter in the central nervous system. It is the consensus of opinion that neostigmine acts as an anticholinesterase agent to prolong the action of acetylcholine at the neuromuscular junction and at synapses. Like most quaternary salts, it cannot penetrate the central nervous system. Neostigmine acts as an anticurare agent by building up the concentration of acetylcholine until the threshold for stimulation is reached. Tensilon, a simple analog of neostigmine, is more specific as an anticurare agent than neostigmine, and is believed to act like acetylcholine itself in displacing curare from the site of action and stimulating the muscle directly, but considerable evidence is accumulating that it may act partially as an anticholinesterase agent.

Numerous synthetic curarimimetic agents are now known, and some have found clinical usefulness. These synthetics have been classified into two divisions, the tubocurarine-like compounds and the decamethonium-like compounds. The tubocurarine class acts by competing with acetylcholine for receptors at the neuromuscular junction and the action is antagonized by neostigmine or Tensilon. The decamethonium class acts by depolarizing the muscle membrane just as acetylcholine itself does and, consequently, the action is not antagonized by neostigmine or Tensilon. Intermediate classes having some of the properties of both of the above classes are becoming available, and even decamethonium itself may have a complex mode of action instead of being purely depolarizing. (Authors' abstr.)

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An Evaluation of Intravenous Ether as a Treatment for Psychiatric Patients.

1. Seventy-three committed patients diagnosed as having affective psychoses were divided at random into three treatment groups: one group received intravenous ether, one group intravenous saline, and a third group electric shock treatment.

2. Of the 37 patients who received intravenous ether 37·8 per cent. were scored as " improved " ; 52·9 per cent. of the 17 patients who received intravenous saline were scored as " improved " ; and 89·4 per cent. of the 19 patients who received electric shock treatment were so scored. A comparison of the results obtained following intravenous ether and intravenous saline showed statistically no significant difference. The improvement following electric shock treatment was significantly higher than that obtained following either intravenous ether or intravenous saline.

3. Twenty-two of the patients who failed to improve with intravenous ether were then given electric shock treatment ; and 19 of these improved sufficiently to leave the hospital ; 7 of the patients who failed to improve with intravenous saline were then given electric shock treatment and all 7 improved sufficiently to leave the hospital. A comparison of the results obtained by electric shock treatment alone with those obtained by a combination of ether and electric shock or saline and electric shock showed no differences considered significant by statistical methods.

4. Autonomic nervous system tests showed that patients whose autonomic reaction was classified as " favourable " as far as electric shock treatment was concerned showed a higher rate of improvement with ether than did patients whose autonomic reaction would indicate a poor prognosis with electric shock treatment. However, the improvement rate in the " favourable " autonomic group cases was poor as compared with the expected improvement rate of similar cases treated with electric shock treatment.

5. It is concluded that intravenous ether as a treatment for affective psychoses showed no specific treatment effect that could not be obtained by intravenous saline, and that electric shock treatment was a much more efficacious treatment than ether in such cases. (Authors' abstr.)

Prefrontal Leucotomy for the Attempted Prevention of Recurring Manic-depressive Illnesses.

Evidence is presented to indicate that recurring manic-depressive illnesses are not inevitable.

" Prophylactic electroshock " prevents some recurrences, but the method requires the prolonged co-operation of the patient and is often distressing and distasteful to the patient. Moreover, electroshock is not without its own hazards.

" Prophylactic leucotomy " also prevents some recurrences. It does not require the continued co-operation of the patient. Follow-up studies in the authors' series of cases indicate that no patient has had a recurrence of symptoms, the maximum length of postleucotomy observation being approximately 4 years. A longer period of study is, of course, necessary, and it is proposed to follow these patients through the after-care department for many years. (Authors' abstr.)

What Happens to Alcoholics.

Approximately 28 per cent. of all alcoholics will drink themselves to death, 7 per cent. will regain partial control of their drinking, 3 per cent. will be able to drink moderately again, and 29 per cent. will continue to have the problem of drinking throughout their lifetime. Twenty-two per cent. will stop drinking during a terminal illness and 11 per cent. will quit drinking exclusive of a terminal illness.

Most alcoholics who quit drinking will probably do so on their own without outside help (7 per cent. of this series of 500 cases). Spiritual reconversion has been the biggest help to alcoholics who have become abstinent (3 per cent. of this series). In the past medical treatment has been of some, but not great help (1 per cent. of this series).

The average age at death of these 500 alcoholics was 52 years. Many alcoholics quit for prolonged periods of time only to relapse at some later date. Eleven per cent. commit suicide. (Author's abstr.)

Differential Indications for the Use of Glutamic Acid.

The 11 epileptics showed a rise of 13 points on medication, and the 9 psychotics showed an average rise of 19 points, but no basic change in the psychotic picture, aside from better contact with reality.

The 106 emotionally immature, mentally retarded, brain-insulted children were of 3 types, as follows :

1. Twenty-four children suffering from malnutrition in early infancy, 10 having been decidedly premature, showed an average rise in I.Q. of 17 points.

2. Twenty-five children who had suffered from head injuries, 12 of these at birth and 13 at a later date, showed an average rise in I.Q. of 19 points.

3. Fifty-seven children who had suffered from brain insults (12 encephalitics, 6 " character change after high fever," 12 otitis, 7 measles, 5 appendicitis, 3 pneumonias, and the remainder various other illnesses, all followed by change in character) showed an average rise in I.Q. of 16 points.

From the above findings the writer concludes that, while glutamic acid is of little or no use in most cases of mental retardation, it is of decided value where that retardation is accompanied by a history of brain insult and emotional immaturity. (Author's abstr.)

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Neuropathologic Lesions following Lobotomy : A Study of Fifteen Cases of Bilateral Prefrontal Leucotomy.

The objectives of this survey were the study of the brain changes following lobotomy and the influence of infection, toxins, systemic disease, etc., on the course of healing of the wound. The findings in the cases of long and short survival are compared and evaluated.

1. The brain wound is larger than the original incision in all cases.

2. The process of repair in an aseptic wound is slow and when completed results in cystic necrotic formations in the white matter of frontal lobes.

3. The cortical wound heals faster than the subcortical.

4. The meninges are thickened, and there are often adhesions between the dura, lepto-meninges, and the cortical wound.

5. The process of repair may be greatly retarded by bacterial infections, toxins, focal and systemic infection, nephritis, etc., preceding or following lobotomy.

6. Because of technical difficulties, more tissue is destroyed than the rationale of this treatment warrants.

7. The clinical expression of this added destruction may account for many symptoms beclouding the release of tension and anxiety achieved by sectioning of the thalamofrontal fibers. (Authors' abstr.)

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Effect of Prefrontal botomy on Intellectual Functioning in Chronic Schizophrenia.

The Wechsler levue Intelligence Scale, Raven's Progressive Matrices, the Wechsler Memo ale and the Benton Visual Retention test were used to study the effects of p tal lobotomy on intellectual functioning in a group of patients with chronic s hrenia. By comparison of the scores obtained prior to operation with thos ained at successive intervals of three weeks, three months, six months, and one year after operation, an indication of the gains or losses in intellectual functioning was demonstrated at each period. After the operation all the four tests showed the same general increase in intelligence.

The most important finding in this study is the significance of the time factor in testing intervals. Three weeks after the operation a decrease in intellectual functioning was apparent, but it was followed by a gradual increase, until by the six-month period the intellectual functioning had arisen to equal, if not surpass the pre-operative level. Moreover, further increases in intellectual functioning were demonstrated at the one-year period. This would suggest that any conclusions made before a sufficient period had elapsed after the operation would only be misleading, and probably false.

When the intelligence of psychotic patients was compared with their premorbid intelligence, impairment was exhibited. But when the study was continued over a sufficient length of time, a gradual increase in intellectual functioning was noted, the intelligence exceeding the pre-operative level at least, and with a tendency to equal the premorbid level. It may be suggested, then, that the deficit in intelligence is not due entirely to prefrontal lobotomy, but may be caused in part by the deteriorating effect of the psychosis.

On the evidence presently available, it would be presumptuous and imprudent to conclude that prefrontal lobotomy has no effect on intellectual functioning, but it can be stated that after the lapse of six months no adverse effects on intellectual functioning were demonstrated by the objective psychometric measures utilized in this study. (Author's abstr.)

Test of "the Abstract Attitude" in Chimpanzees Following Ablation of Prefrontal Cortex.

The subjects of this study were two chimpanzees that had undergone bilateral ablation of the prefrontal cortex at the age of 2 months and two normal (control) animals. All four animals were trained on a three-cue discrimination problem, and were then tested with pairs of objects which presented only one of the stimulus differences. Subsequently the animals were trained on the reverse of the original discrimination and were then given single-cue tests based on the reversed habit. It is suggested that the single-cue tests provide an index of sensory abstraction, which is probably the principle function tapped by the sorting tests often used with human patients as a measure of the "abstract attitude." No significant differences between the experimental and the normal subjects were found in the reduced-cue tests, initial learning, or reversed learning. All four animals were able to discriminate on the basis of the component properties of the training stimuli.

The two animals with prefrontal ablations gave more frequent and more violent emotional expression to the frustration of failure than did the slightly older control subjects. (Authors' abstr.)

Relation of Social Attainment to Psychological and Adrenocortical Reactions to Stress.

These findings may be briefly interpreted as follows:

Subjects with higher social attainment, particularly in the area of formal group associations, showed more adaptive responses to the Target Ball Frustration Test. They were less stressed physiologically; i.e., less pituitary-adrenal response, measured by the increase in the rate of excretion of 17-ketosteroids, was evoked. They shifted their goals more realistically after failure.

In the continuation of this study scales of social attainment and adjustment will be constructed, using material from psychiatric interviews with normal men. With the use of these scales, the subject's interpersonal adjustive mechanisms and his pituitary-adrenal and psychologic responses to experimental stresses will be explored further. (Authors' abstr.)

Personality Factors in Denial of Illness.

The premorbid personalities of 28 patients with brain [illegible]se who explicitly denied illness, including such disabilities as hemiplegia and v[illegible]loss and the fact that a craniotomy had been performed are reviewed. The [illegible]s are compared with those in a group of 28 patients with comparable disabilitie[illegible]ilar lesions and electroencephalographic records, but without explicit verbal de[illegible].

Explicit verbal denial occurred only in patients who had previously demonstrated certain personality attitudes. They were people with compulsive drives, a great need for prestige and the esteem of others, and a record of always having denied felt inadequacies. Illness was regarded as an imperfection which had to be denied or justified. Life experiences had been valued, not for their intrinsic satisfactions, but as a means of maintaining prestige and " security."

In the patients whose attitudes had been expressed predominantly in verbal symbols, in concern with " principles " and " being right," the denial was most complete and the mood was usually affable and serene. In the patients whose feelings were expressed in more " physical " symbols, relating especially to the body, food, and sexual activity, denial was less complete and the predominant mood was paranoid.

Explicit verbal denial is only one of the symbolic expressions of denial. Implicit manifestations include drowsiness and muteness, certain motor acts, alterations in sexual behaviour, and the use of humour. While an altered milieu of brain function is necessary for the existence of all these patterns of denial, the choice of the particular element is determined by personality factors. (Authors' abstr.)

Adrenocortical Responsibility to Electric Shock Therapy and Insulin Therapy.

A study of the adrenocortical responsivity to insulin and/or electric convulsion therapy in 56 patients in a state hospital is presented. The relations of the adrenocortical response to duration of illness, sex, type of treatment, and prognosis are discussed. Of the 56 patients receiving somatic therapy, approximately 91 per cent. had a responsive adrenal cortex. Approximately 9 per cent. showed no response in the function of the adrenal cortex. Of approximately 91 per cent. of the patients in whom the somatic therapy influenced the adrenal cortex, the somatic therapy had an antiadrenocortical effect in approximately 80 per cent. and a stimulating effect on the adrenal cortex, as evidenced by the cellular changes, in approximately 11 per cent. Of the approximately 9 per cent. in whom the adrenal cortex was unresponsive, all remained unimproved. Of the 80 per cent. of patients in whom the somatic therapy had an antiadrenocortical effect, approximately 75 per cent. showed improvement in their mental condition with 15 patients much improved and 18 patients improved.

Although a functional disease may be a result of or a cause of, or may have no direct relation to, an unresponsive adrenal cortex, the eosinophile level may give a clue to the patient's diagnosis, based on the function of the response of the adrenal cortex to stress (somatic therapy).

In general it can be stated that a fair prognosis can be expected in patients on whom the somatic therapy had an antiadrenocortical effect, and that patients with an adrenal cortex unresponsive to somatic therapy have a poor prognosis. There is no correlation between the degree of the depression of the function of the adrenal cortex and the extent of the patient's improvement. (Authors' abstr.)

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A Study of Thalamic and Cortical Rhythms in Petit Mal.

Electrographic records have been obtained from the thalamus, white matter, and cerebral cortex during *petit mal* in children. A large number of attacks have been studied in 6 cases.

The sequence of events in the *petit mal* attack was found to be :

(1) A rhythm of 3-a-second begins in the thalamus. This rapidly increases in voltage and persistence until it reaches the cortex.

(2) When it has done so a fast spike originates deep in the cortex. The " initial spike " usually has a high voltage and it travels down to the thalamus.

(3) When this spike reaches the thalamus the site of origin of the 3-a-second wave alters and becomes more superficial (lateral and ventral) within the thalamus.

(4) The wave which has now arisen in a new position in the thalamus is then followed by a spike which seems to arise deep in the cortex. This process is repeated in a stereotyped way.

(5) As the attack proceeds the speed of the rhythm usually falls slightly from 3 to about 2·5 a second. After it has done so the voltage of the cortical spike rapidly drops. The spike then ceases and the wave then similarly decreases in size and disappears.

(6) Although the thalamic rhythm seems to be responsible for the cortical spike, the spike seems to be essential for the continuation of the 3-a-second rhythm ; for if the rhythmic wave recommences and no spike occurs, the rhythm is not sustained.

(7) The average time taken for the spike to travel from the deep part of the cortex and ultimately to reach the thalamus is about 14 milliseconds, and that for the wave to return is of the same order.

(8) Each step in this chain of events is essential for the complete phenomenon of the " spike and wave discharge " of *petit mal* epilepsy. It seems, for example, to be necessary for the development of an attack for the initial 3-a-second wave to arise in a constant position deep within the thalamus. If this rhythm recurs in the secondary more superficial position which it adopts in a developed attack, it does not initiate a cortical spike. The rhythm then dies and the attack is stillborn.

(9) These results have been related to the results of animal experiments carried out in other laboratories and to observations on patients in stupor.

(10) The hypothesis is advanced that the clinical state of *petit mal* epilepsy is due to a disturbance in the thalamus which causes a rhythmic discharge throughout the cortex. The effect of this is a failure in the integration on the afferent side of the organism. This results in secondary akinesis, flaccidity and amnesia, which form the basis of the disability in the *petit mal* attack. Many of the differences in observed behaviour in *petit mal* and *grand mal* attacks can be explained upon this basis, regarding *petit mal* as a periodic disorganization of the afferent, affector side of the organism, which inhibits all awareness and " spontaneous " behaviour, in contrast to the other forms of epilepsy in which the disorganization occurs in the effector mechanisms. (Author's abstr.)

The Experience and Description of the Human Body.

We should differentiate between the physical body and the perceived body on the grounds of spatial location. The latter should be regarded as being coincident

in space with the body-image in the brain of the physical body *if the theory of psycho-neural identity is held to be true*. In Broad's terminology (1923) the perceived body is a sense-field or cross-section of a sense-history. The physical body is a physical object. They are connected by Broad's formula *o–R–s*, in which the author has suggested (1952) that *R* stands for connection by signalling mechanism. The perceived body is directly experienced *inside* central consciousness. The existence of even the individual observer's own physical body is inferred. The term body-image should be reserved to describe a visual, mental, or memory image of a human body. Body-images are experienced. The constant visual imagery relating to the body and parts of the body associated with movement and sensation is integrated, largely by the sub-conscious system of servo-mechanisms, into the unitary function of the human organism. The term " body-schema " should only be used in its original sense. It is part of the subconscious mind and thus its presence is inferred. The body-concept is a conceptual constellation, and depends largely upon the proper function of the relevant memory mechanisms.

Before any sense can be made in the scientific approach to the mind-body problem it is essential that everyone, when using a term, should know exactly what it means, and that other people, using the same term, should mean precisely the same thing. This applies especially to terms describing the human body as this appears from various viewpoints—to the body itself and to the small model of itself which it carries within it. Otherwise nothing but confusion can result.

(Author's abstr.)

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An Analysis of Central Responses to Photic Stimulation in Normal Adults.

E.E.G.'s during rhythmic photic stimulation were recorded from 154 young normal adults and 40 mentally normal seniles with the following results and conclusions :

1. There was a significant association between the existence of spontaneous rhythms in the alpha and beta bands and evocation of responses by stimulation at these frequencies. This was attributed to a resonance effect.

2. A similar relation was observed between spontaneous beta rhythm and the occurrence of 2nd and 3rd harmonies of the stimulus frequency, also attributed to resonance.

3. There was no statistical relationship between spontaneous and evoked theta rhythm, nor with the occurrence of subharmonies.

4. There were no significant differences in flicker following characteristics between the young and old groups, but a significantly smaller incidence of 2nd subharmonies was found in the old group. This was tentatively attributed to maturation factors. The old group also showed a significantly greater incidence in the occurrence of 3rd harmonics, possibly related to the tendency for greater amplitudes of spontaneous beta rhythm in these persons.

5. No statistically significant sex differences were observed.

6. 3·9 per cent. of the young group and 2·5 per cent. of the old showed frankly abnormal responses; 3·25 per cent. of the former and 2·5 per cent. of the latter showed questionable responses. All abnormal responses were epileptiform. Questionable responses were slow and often paroxysmal, usually harmonically related to the stimulus frequency.

7. Significantly greater incidences of following in the beta range and in the occurrence of 2nd and 3rd harmonies were found in these subjects possessing mean alpha frequencies above the mean of 10·3 c./sec. than in those with alpha frequencies below the mean. This was discussed in relation to the temperament variable secondary function, and may provide a possible measure of its behavioural strength.

8. Incidence of beta following and of 3rd harmonics was significantly greater in those subjects with " minus " type alpha rhythms as opposed to those with " responsive " or " persistent " alpha rhythms. This was briefly discussed in relation to imagination.

9. Observations of subjective sensation largely accorded with those of Walter and Walter. Abnormal and questionable responses were usually accompanied by more vivid and disturbing sensations. Subjective sensations are attributed to (i) interaction between spontaneous and evoked activity and/or (ii) augmentation of harmonically related rhythms. These effects may occur in any part of the brain, and in the case of non-visual sensations at least would involve thalamocortical systems. All may be present simultaneously, and all may affect or be altered by mental state, either intellectual or emotional. Subharmonic responses were tentatively attributed to possible instability or immaturity or cortical development.

10. Photic stimulation provides a valuable means for studying the behaviour of different rhythmic processes during changing mental content, since these can be amplified either as fundamentals or harmonically related components by appropriate rhythmic stimulation. A frequency analyser is essential for such study.

(Author's abstr.)

The E.E.G. and Reaction to Photic Stimulation as an Index of Anxiety-proneness.

One hundred and ninety-one subjects (patients and controls) were utilized in an attempt to develop an E.E.G. measure for selecting anxiety-prone individuals. All were carefully studied by psychological tests and psychiatric interviews and rated for their proneness to develop anxiety under stress. E.E.G.'s were taken under resting conditions and during intermittent photic stimulation. An electronic brain wave analyser was used.

There was a significant correlation between the criteria of anxiety-proneness and the following:

1. Per cent. of fast, slow and low alpha activity in the electronically analysed resting E.E.G.

2. Pattern of fundamental driving response.

3. Amount of harmonic driving response, particularly in the 20–30 c./sec. range to stimulation with flicker frequencies half or a quarter this rate.

4. Amount of subjective dysphoria produced by intermittent photic stimulation.

A check list of E.E.G. anxiety indicators derived from the above correlated 0·51 with the validating criterion of anxiety-proneness. (Authors' abstr.)

Value of Electroencephalography for the Differential Diagnosis of Neurosis and Organic Brain Disease.

1. Electroencephalographic findings of 263 patients with a clinical diagnosis of psychoneurosis were evaluated.

2. Sleep electroencephalograms on 200 patients revealed a 19 per cent. significant abnormality with clinical correlation.

3. Epileptic seizure discharges were recorded in 14 per cent. of those patients studied with sleep recordings.

4. The value of sleep electroencephalographic studies in clinical entities with a low titre of electroencephalographic abnormalities is emphasized.

5. A diagnostic electroencephalogram may be of value in a differential diagnosis in presumptive psychoneurotics with such complaints as major convulsions, abdominal complaints, amnesia, visual disturbances, rage attacks, nausea and vomiting and weakness—fainting—blackouts. (Author's abstr.)

Spontaneous Excitation of the Visual Cortex and Association Areas : Lambda Waves.

1. Lambda waves are seen in the visual areas of relatively few persons, when the eyes are opened, and disappear on eye closure.

2. Lambda waves depend on light entering the eyes, and disappear in darkness.

3. Lambda waves are blocked if vision is fixed on a point, or if the field being viewed is uniform ; they are most frequent during pattern vision.

4. When lambda waves are present, the area showing them also exhibits a large response to photic stimulation. (Author's abstr.)

Cortical and Subcortical Recordings in Natural and Artificially Induced Sleep in Cats.

1. A technique was developed for recording the subcortical and cortical potentials of unrestrained waking animals. Bipolar records were made between points in frontal, parietal and occipital regions of the cerebral cortex as well as from the intralaminar region of the thalamus and from the head of the caudate nucleus. The E.E.G. could be correlated continuously with behaviour.

2. The *resting* rhythm of the cat, unlike the human alpha rhythm, consists of short irregular bursts of high voltage 5–8 c./sec. waves. Feline sleep patterns reveal striking similarity to those in man. There is a stage of *drowsiness* corresponding to the human C-stage in which appear spindles of 11–16 c./sec. waves of 200–400 μV., V-waves (Liberson) and occasional sharp wave-like potentials. In *deep sleep*, corresponding to the human D-stage, there are bilaterally synchronous 1–3 c./sec. high voltage waves predominating for prolonged periods. However, stages comparable to the human B-stage and E-stage cannot be identified with certainty, and spindles are not a reliable indication of the depth of sleep.

3. Subcortical and cortical potentials are similar in form and often occur simultaneously. Synchrony is greater in sleep potentials than in resting rhythm. There is remarkable variability in the crossed and uncrossed association of the potentials of cortical and subcortical levels. A constant site of origin of sleep and rest waves could not be established. However, slow waves are more often observed in subcortical recordings, while spindles are prevalent in the cortical tracings. There is no evidence that sleep potentials constantly arise in the subcortex.

4. As a rule alterations in the E.E.G. run parallel to changes in behaviour, although the latter may precede evident variation in the electrical activity by 20–30 sec. during the onset of sleep. Occasionally there is dissociation of behaviour and E.E.G. during the early stages.

5. The records taken during sleep induced by electrical stimulation of the thalamus and during the akinetic drowsy stage following stimulation of the caudate nucleus bear close similarity to the E.E.G. of normal sleep. There are striking differences between the patterns of normal sleep and barbiturate narcosis. The barbiturate spindles are analogous to the drowsiness spindles of the somnolent animal. However, as narcosis deepens they become altered in form and markedly slowed. Another characteristic of barbiturate anaesthesia is the independent formation of atypical delta waves in the caudate nucleus. (Authors' abstr.)

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The Clinical Significance of Photic Stimulation.

An analysis of central responses to rhythmic photic stimulation among a variety of clinical groups revealed the following results and conclusions :

1. Abnormal responses ranged from 13 to 25 per cent. in groups of patients suffering from probable epilepsy and allied disorders, and were more frequent in cases with minor than major or other type seizures. Incidence of abnormality rose to 36 per cent. among behaviour deviate children without fits and 68 per cent. with fits. Abnormal responses fell largely into three categories : wave-and-spike (W.S.), frontal spike and dysrhythmic, although all may be present in the same individual. Details of questionable responses were also outlines.

2. A significantly greater incidence of 3rd subharmonics and significantly higher mean amplitudes of responses in theta and low alpha (8–10 c./sec.) bands were found amongst patients with probable epileptic and allied disorders than among 154 young normal adults. This was not the case in an African group comprising chiefly major and other type seizures.

3. The importance of harmonic, subharmonic and phase relationships in the formation of seizure activity was stressed, particularly in the occurrence of the W.S. response. Slow components of the latter and slow waves associated with frontal spikes appear to operate in at least two possible ways ; one as a release mechanism permitting irradiation of afferent visual responses at a diencephalic level, the other as a protective, self-limiting device prohibiting the occurrence of further spikes. Slow waves in the former category are often 3rd or lower subharmonics and are attributed to resonant excitation at the diencephalic level. It is postulated that this activity is reflective of a constitutional electro-cerebral instability, and that such responses should not be regarded as normal.

4. Abnormal responses to photic stimulation in some psychiatric disturbances may disappear during varying time intervals ranging from a few minutes to several months. The former may be due to soothing and calming, the latter appears to be related to successful treatment, whether it be physical, psychological or both. The involvement of diencephalic structures in certain psychotic and psychoneurotic disorders is implicated, and the need for further research stressed.

5. The high incidence of abnormal responses to photic stimulation among young behaviour deviates, particularly those with fits, was attributed to thalamo-cortical instability and immaturity of cortical development. Amplitudes of theta responses and incidence of 3rd subharmonics were also high among these groups. It was suggested that responses to photic stimulation may provide some measure of psychological and particularly emotional stability in children.

(Author's abstr.)

Sensory and Thalamic Synchronization in the Olfactory Bulb.

1. The electrical activity of the olfactory bulb may be synchronized by blowing air into the ipsilateral nostril (Adrian's induced waves), or during the initial phase of anaemia produced by clamping bilaterally the common carotid arteries. This synchronization is peripheral in nature, since it is observed after severing all connections with the brain.

2. Recruiting responses are recorded from the surface of the olfactory bulb during low-frequency thalamic stimulation. Although smaller in amplitude than the corresponding potentials led from the motor cortex, the recruiting waves represent a genuine thalamically induced synchronization of the olfactory bulb, since they are selectively abolished when this structure is anatomically but not physically disconnected from the brain.

3. Only the centrally induced synchronization is abolished during bulbo-reticular activation. When "wave and spike" patterns timed by the thalamic stimulation

occur in the olfactory bulb, the wave component may be selectively blocked by appropriate bulbo-reticular stimuli. The significance of these findings is discussed. (Authors' abstr.)

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Deposits of Fluorescent Acid-fast Products in the Nervous System and Skeletal Muscles of Adult Rats with Chronic Vitamin-E Deficiency.

Neuromuscular lesions, in particular the regular occurrence of deposits of fluorescent, acid fast products in the nervous system and skeletal muscles of adult rats that have long been kept on a vitamin-E deficient diet, are reported. The findings generally confirm the earlier observation and description by Einarson and Ringsted (1938) of these neuromuscular lesions, and in particular of lipoid products in the nervous system of adult rats in chronic vitamin-E deficiency. Furthermore, it is demonstrated that the nerve cell changes and the acid fast deposits are far more widely distributed in the nervous system than was previously thought.

A brief account is given of the clinical symptoms displayed by rats, and some remarks on technique.

The histological examination clearly shows that the disease is due to a combination of neurogenic and myogenic lesions as originally maintained by Einarson and Ringsted (1938, 1939). The lesions consist of degeneration of the dorsal roots and posterior fasciculi of the spinal cord, myogenic changes of the skeletal muscles followed by pronounced changes of the visceral and somatic motor and sensory

cells of the spinal cord and brain stem, as well as of the cells of the spinal and cranial ganglia, and gradually features of neurogenic muscular atrophy are superimposed on the earlier myogenic changes. Somewhat later there appear mild changes in the sciatic nerves and marked diffusely distributed cell changes in the central nuclei of the brain and the entire cerebral cortex, followed by mild cell changes in the cerebellum.

Everywhere the changes are highly characteristic of the lipoid products. Besides staining reddish-orange with fat stains they are characterized by their relative insolubility in lipoid solvents, their affinity for basic aniline dyes (orthochromatic staining), their acid-fastness when stained by Ziehl-Neelsen's carbol fuchsin, their bright, yellow, primary fluorescence on ultra-violet irradiation, and by the fact that they are left completely unstained by gallocyanin-chromalum, a stoicheiometrical staining reaction for nucleic acids. These properties strongly suggest that we are dealing with a lipoprotein combination (ceroid) which does not contain nucleic acids.

The fluorescent acid-fast products appear as fine, rounded granules or coarsely globular particles, sometimes coalescing to compact masses. They lie in the cytoplasm of the nerve cells, in or about glial cells and histiocytes, and in the walls of the blood-vessels, and they occur almost all over the nervous system. In the muscles they lie both inside and outside the muscle fibres. They are regularly absent in controls receiving protective doses of vitamin E.

In the nerve cells the progressive increase of the fluorescent acid-fast substance invariably involves a corresponding decrease in the ribonucleic acid of the cytoplasm until it completely disappears, a cell change accompanied by more or less eccentric displacement, hyperchromatosis, and shrinkage of the nucleus ("cellular lipodystrophy." The early appearance and marked intensity of this cell change in the autonomic centres of the spinal cord and brain stem is particularly emphasized.

The changes must start at a submicroscopic, biochemical level, and their early irreversibility is pointed out.

Fluorescent, acid-fast products comparable with those described in rats may be observed in human necropsy material, more or less mixed with the commonly occurring lipochrome. (Author's abstr.)

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Cortical Response to Activity of Callosal Neurons.

Preliminary to the analysis of callosal potential, the origin and termination of callosal fibers have been considered on the basis of Golgi and Golgi-Cox preparations. Neurons contributing axons or collaterals to the corpus callosum are mainly those situated in the deeper strata and especially layer VI of the cortex, whereas the

terminals of these fibers are mainly distributed as free endings in the upper layers (layers I, II and III).

The electrical response to stimulation of a symmetrical point on the contralateral cortex was found to be localized in a restricted cortical area with a focus characterized by the appearance of a maximal negative spike. Although its basic pattern remained fairly constant throughout the isocortex the callosal potential varies in detailed wave from from region to region, depending presumably on the distribution of callosal neurons in the respective cortical areas.

On the basis of the distribution of the cortical response to direct callosal stimulation, a topical relationship was found existing between the corpus callosum and the cerebral cortex.

The response pattern of callosal potential varies with the stimulus strength from a simple diphasic wave into a deep and broad positive wave, superimposed by a sharp negative deflection and followed by a prolonged negative phase. This response pattern can be broken up into three partly superimposed constituent parts: The first is an initial positive phase caused by the antidromic volley and the presynaptic orthodromic impulses; the second is a superimposed sharp negative deflection, which is interpreted as representing mainly the activity of the superficially placed callosal afferents and their postsynaptic neurons; and the third is a slightly prolonged positive-negative diphasic wave attributable to the activity of the rather diffused callosal afferents terminating in the second and third layers and the postsynaptic discharges therefrom.

The second component can be readily and selectively abolished by local application of novocaine to the cortical surface. The first components and a part of the third, which are considered as representing the antidromic and the orthodromic incoming volleys, cannot be enhanced by local strychninization of the cortical surface.

(Author's abstr.)

Interaction of Evoked Cortical Potentials.

The interaction in the sensory cortex of the thalamic, callosal and locally induced cortical impulses has been studied by means of various combinations of paired stimuli at different intervals. It is found that the early positive phase of the callosal potential and the locally evoked cortical dendritic potential are mutually exclusive. The negative component of the callosal potential can be completely inhibited by the dendritic potential and, similarly, the dendritic potential will be completely blocked if the direct cortical stimulation is made during the rising phase of the negative component of callosal response.

The interaction between the thalamic and callosal volleys is characterized by the following phenomena: (i) The first negative component of callosal potential has a blocking effect on the positive component of the primary cortical response to auditory (thalamic) stimulation. (ii) The negative component of the cortical response to sound stimulation suffers severe and prolonged inhibition from the callosal potential. The former is believed to be due to the partial involvement of apical dendrites of common neurons in both kinds of potentials, and the latter can be taken as an indication of inhibitory effect from the activity of intracortical internuncial neurons. (Author's abstr.)

Linear Relationship between Fiber Diameter and Velocity of Conduction in Giant Axon of Squid.

1. Conduction velocity and fiber diameter have been measured in the main trunk of the largest stellar nerve ("ultimate") of the common squid. The diameter and conduction rates have thus necessarily been studied over a very limited range (260–543μ and 18·2–34·8 m./sec. respectively). The range of the fiber sizes studied in this animal should be extended.

2. The conduction velocities given in this paper are considerably faster than those reported previously. This discrepancy is shown to be due to technical defects of earlier experiments.

3. Conduction velocity increases approximately 6·5 m./sec. with an increase in diameter of 100μ.

4. The relationship between diameter and conduction velocity is a linear one, and is in accordance with the accepted correlation for verbetrate and myelinated

nerves. The square root relationship previously described for this cephalopod nerve is shown to be in error, and due in large measure to some of those technical faults which gave the low conduction rates. (Author's abstr.)

Effects of Nembutal in Baboons with Frontal Lesions.

After receiving six months of intensive post-operative training three baboons with dorsolateral frontal lesions and three with ventromedial frontal lesions were trained while under the effects of Nembutal on a delayed-alternation problem. The scores of three animals showed significant improvement, demonstrating that barbiturates may facilitate performance even though prior to sedation animals have been allowed an extended recovery period. It is suggested that prolonged training with sedation is an important though not a sufficient condition for improvement. No consistent relationship appeared, however, either between the locus of lesion or the previous performance level and the effect of the drug. (Authors' abstr.)

Action Potentials in "Motor" Cortex Evoked by Peripheral Nerve Stimulation.

1. The presence and pattern of distribution of action potentials in the motor cortex evoked by peripheral electrical stimulations as previously described has been confirmed in monkeys.

2. These action potentials are unaltered by resection of either the post-central gyri or the cerebellum, or both, The known anatomical pathways are insufficient to account for these results.

3. These action potentials can be evoked from electrical stimulation of both muscle and skin nerves. (Authors' abstr.)

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Perceptual Constancy in Schizophrenia. I : Size Constancy.

This paper presents, as part of a larger investigation, a study of size constancy in schizophrenia. The subjects utilized in the experiment were 30 paranoid schizophrenic patients, 30 nonparanoid schizophrenic patients, and 30 college student controls.

A consideration of the possible relationship between ego-structure and the constancy mechanisms led to the formulation of the following hypotheses : (1) paranoid schizophrenics would tend to show higher constancy scores than normals ; (2) nonparanoid schizophrenics would tend to show lower constancy scores than normals ; (3) the groups would tend to approach each other in their scores when the number of cues was increased.

The hypothesis that the paranoids would show higher constancy scores than the normals was confirmed. The hypothesis that the nonparanoid schizophrenics would show lower constancy scores than normals was not confirmed. There was a trend for differences between the groups to be reduced when the number of cues was increased ; this trend was significant, however, only for the paranoid-normal comparison. Some limitations and possible implications of these results are discussed. (Author's abstr.)

An Experimental Study of Schizophrenic Interpretations of Non-representational Painting.

The question that stimulated the present study was whether the schizophrenic, by virtue of the breakdown of his own repressive mechanisms, was thereby rendered more sensitive to the expression of unconscious material on the part of others. To test this hypothesis a series of nonrepresentational paintings by recognized contemporary artists was presented for interpretation to a group of thirty-one schizophrenics and an equal number of non-schizophrenic controls. Analysis of the protocols by experts in projective techniques revealed an over-all tendency for the schizophrenics, in comparison with the controls, to respond on a more "symbolic" level that was less in keeping with the manifest content of the picture. Moreover, the task seemed to absorb their interest more completely, resulting in notably greater productivity.

A breakdown of the data with respect to specific paintings on the whole confirmed the general trend, but reached statistical significance for only the Kandinsky and Picasso selections. To determine the basis of the special value of these particular pictures an empirical content-analysis was undertaken. Although no reliable group differences were found, there was a tendency for the schizophrenic subjects to respond in greater detail. This was interpreted as a reflection of greater projectivity of the psychotics in response to the ambiguity of these pictures, rather than as an intuitive grasp of the artists' unconscious symbolism.

The second part of the experiment was concerned with the interpretations of paintings by a psychotic patient. "Correct" interpretations obtained through the records of therapy sessions were available for comparison with those made by the subjects. Analysis of the experimental protocols failed to reveal the schizophrenics as more sensitive than non-schizophrenics to the symbolism of the artist. The only reliable intergroup difference was the schizophrenics' greater reactivity to color regardless of specific symbolism.

We may conclude that within the limits of the evidence reported in this experiment, the hypothesis that the schizophrenic responds to pictorial art on a more symbolic and less realistic level than the non-schizophrenic is supported. The corollary, however, that dependence on archaic, symbolic modes of thinking makes the schizophrenic more sensitive to the specific unconscious symbolism of others received no confirmation from the present date. It still remains a heuristic hypothesis that should be put to further experimental check. (Author's abstr.)

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A Treatment Plan Combining Group and Individual Psychotherapeutic Procedures in a State Mental Hospital. *Green, J.* 245
*Histamine Therapy in Psychiatric Disorders. *Polatin, P., et al.* 254
Dream Life in a Case of Hebephrenia. *Karpman, B.* 262
Ligation of the Anterior Choroidal Artery for Involution Movements. *Cooper, I. S.* 317

Histamine Therapy in Psychiatric Disorders.

1. The effects of histamine therapy were clinically evaluated in 23 psychiatric patients, all of whom had been in the hospital for less than one year.

2. The diagnoses of these 23 patients included: Schizophrenia, 16; manic-depressive, depressed type, 2; involutional paranoid, 1; psychoneurosis, conversion hysteria, 2; and organic psychosis, 2.

3. The results in this group of 23 patients were as follows: two patients with psychoneurosis, conversion hysteria, responded favourably. Fourteen patients showed no change. Seven patients had aggravations of symptoms when therapy was completed.

4. Histamine therapy is ineffective in the treatment of psychiatric disorders.

(Author's abstr.)

PSYCHOANAL. QUART.

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Clinical and Therapeutic Aspects of Character Resistance. *Sterba, R. F.* . 1
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PSYCHOSOM. MED.

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The Central Representation of the Symbolic Process in Psychosomatic Disorders. *Kubie, L. S.* 1
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Autonomic Response Specificity: An Experimental Study.

Eighty-five male college students were subjected to four stresses in sequence. The stresses were mental arithmetic, hyperventilation, letter association, and the cold pressor test. Palmar conductance, heart rate, and variability of heart rate were simultaneously and continuously recorded. The results were analysed in terms of autonomic tension and autonomic lability. Autonomic tension was defined as the maximum level a physiological function reaches during stress. Autonomic lability was defined as the maximum displacement a physiological function exhibits during stress.

The experiment was designed to test the hypothesis of relative response specificity which states that for a given set of autonomic functions individuals tend to respond with a pattern of autonomic activation in which maximal activation occurs in the same physiological function, whatever the stress. This hypothesis was decisively supported.

The detailed results suggested an extension of the principle of relative response specificity. The revised hypothesis is: For a given set of autonomic functions there exists quantitative variation among individuals in the degree to which a pattern of response is stereotyped. Some individuals are so constituted that they

will respond with a given hierarchy of autonomic activation whatever the stress; others will show greater fluctuation from stress to stress, although they will exhibit one pattern more frequently than others; still other individuals randomly exhibit now one pattern, now another. In addition, although the rank order of reactivity remains the same from stress to stress, the quantitative difference between the degree of activation of the different physiological functions will fluctuate markedly.
(Authors' abstr.)

Photically-activated Electroencephalogram: Research Tool in Psychiatry: Preliminary Observations.

1. Electroencephalography used in conjunction with intermittent photic stimulation seems a promising tool for psychiatric research. The results of a preliminary investigation on 20 psychiatric patients and 45 control subjects are reported.

2. Brief psychiatric and psychological screening examinations revealed that 26 of the 45 "normal controls" showed some evidence of maladjustment. This group was found to have an increased response to photic stimulation at frequencies of 20 to 30 c.p.s., and showed some tendency to greater second harmonic response than 19 subjects who had little or no evidence of personality maladjustment.

3. Rhythmic photic stimulation can, in susceptible subjects, induce subjective sensations, frequently of a dysphoric nature. In psychiatric patients such sensations may take the form of previously experienced symptoms.

4. A lowered convulsive threshold has been demonstrated by the production of seizures by photic stimulation alone in 4 patients with psychiatric disorder whose symptoms included "attacks" with motor manifestations. Myoclonic reactions or generalized seizures were also produced in five control subjects with no personal history of convulsive disorder, all of whom had either some personality disturbance, a personal history of syncope, a family history of convulsive disease, or some combination of these. In individuals in whom seizures were produced certain frequencies seemed critical, whereas adjacent frequencies could produce a less severe reaction or only subjective dysphoria.

5. These findings indicate that a tendency to paroxysmal response may be found in subjects other than those with manifest convulsive disorder, and that such a tendency may occur in subjects who present primarily psychiatric disorders.
(Author's abstr.)

MARCH–APRIL.

*The E.E.G. in Psychological Disorders. *Kennard, M. A.* 95
Studies of the Personality of Patients Suffering from Urticaria. *Wittkower, E. D.* 116
Psychophysiological Factors in Méniere's Disease. *Fowler, E. P., jun., and Zeckel, A.* 127
Ulcerative Colitis. *Karush, A., and Daniels, G.* 140
The Psychosomatic Concept in Dentistry. *Ross, G. L., et al.* 168

The Electroencephalogram in Psychological Disorders.

1. The evidence of many authors, publishing over a period of fifteen years, on the subject of the E.E.G. in psychological disorders has been assembled and evaluated. In the light of the evidence presented certain answers to the questions postulated in the introduction seem clear.

2. There is a greater proportion of abnormal E.E.G.'s in individuals with psychopathology.

3. A certain number of these abnormal records can be correlated with organic focal disturbances of the central nervous system, as indicated by clinical signs and by objective laboratory test other than the E.E.G. At the present time the sole practical significance of an abnormal E.E.G. in a patient with psychopathology lies in the detection and isolation of such cases.

4. There is a far larger group of individuals with psychological disorders who have abnormal E.E.G.'s for which no focal organic pathology has as yet been found. A primary psychological disturbance exists in these cases.

5. The pattern of the E.E.G. in both normal individuals and in those with psychological disturbances is thought to have some relation to personality type.

Instability of personality and instability of E.E.G. pattern have been thought to coincide in many instances.

6. The most obvious abnormality of pattern which is related to psychopathology is one of lowered threshold to various environmental stimuli. Diminished alpha activity and increased fast activity occur also, and the sensitivity may result in paroxysmal dysrhythmia.

7. It is suggested by these data that the factors underlying the pathological sensitivity of electrocortical activity may be one or many of several known to be related to lowered threshold excitability. Hereditary factors play an important part. Changes in the structure and chemistry of the nervous system, as well as psychological factors may contribute.

8. It is very likely that further study of the E.E.G. and psychopathology may produce a better definition of their interrelations. These should be of great theoretical value in the study of both the etiology and therapy of disorders of behaviour. (Author's abstr.)

MAY–JUNE.

*Emotional Reactions of Rheumatoid Arthritics to ACTH. *McLaughlin, J. T., et al.* 187
Dynamically-Oriented Brief Psychotherapy. *Seitz, P. F. D.* . . . 200
Experiences in Group Psychotherapy with the Obese. *Kotkov, B.* . . 243
Psychotherapy of a Hospitalized Orthopedic Patient. *Perman, J. M., and Rapoport, J.* 252
The Patient Sits Down. *White, A. G.* 256

Emotional Reactions of Rheumatoid Arthritics to ACTH.

The size of the series is not such as to justify absolute conclusions. However, the following points are rather strongly supported by the data:

1. The administration of moderate amounts of ACTH to the rheumatoid arthritics of this series produced a significant objective clinical improvement in 50 per cent. of those treated. The preliminary use of a placebo in 8 patients, 5 of whom subsequently responded to ACTH, failed to produce even a slight objective response.

2. The administration of ACTH to patients of this series produced emotional effects that included, but went distinctly beyond, the suggestive effect and passive-dependent gratifications of a highly publicized treatment regime.

3. Patients of this series who received average amounts of ACTH (60 to 80 mgm. per day) did not show gross personality changes. True euphoria did not occur in those patients treated with moderate amounts of ACTH. Two instances of severe emotional disturbance occurred when an average amount of ACTH had failed to evoke a satisfactory clinical response and higher dosages (90 to 120 mgm. per day) were employed.

4. A frequently seen emotional response to ACTH in the patients of this series consisted of an enhanced aggressiveness handled variously according to the established reaction patterns of the individual patient.

5. Feelings of well-being, decreased tension and lessened fatigue were prominent in the patients who gave positive clinical responses to ACTH, whereas increased tension and irritability were seen in the unresponsive cases.

6. An apparently significant relationship was rated between dream recall of arthritics and their clinical response to ACTH.

7. There was an apparently significant relationship between changes in stress levels and clinical response to ACTH. (Authors' abstr.)

Q. J. EX. PSYCHOL.

VOL. 5. JUNE, 1953.

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Q. J. STUD. ALC.

VOL. 14. MARCH, 1953.

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Blood Alcohol Concentrations Resulting from Wine Drinking Timed According to the Dietary Habits of Italians. *Serianni, E., et al.* 165
Sugar, Pyruvate and Acetaldehyde Levels in the Blood of Alcohol Addicts after Ingestion of Dextrose. *Varela, A., et al.* 174
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Social Class Differences in Intellectual Characteristics of Alcoholics. *Murphy, M. M.* 192
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RASS. STUD. PSICHIAT.

VOL. 42. 1953.

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REV. NEUR.

VOL. 87. NOVEMBER, 1952.

Integrative Aphasia from Congenital Auditory Agnosia. *Brisset, C.* . . 387
Minimal Cerebral Life and Pneumo-encephalography. *Fromenty, et al.* . 399

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The Decrease in Aggression after Neuro-surgery and Synergic Medication. *Woringer, E., et al.* 515
Total and Subtotal Hemispherectomy. *Feld, M.* 525
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RIV. PSICOL.

VOL. 48. 1952.

A Contribution to the Theory of Colour Perception. *Musatti, C. L.* . . 121
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Methods and Problems of Industrial Psychology. *Metelli, F.* . . . 147
Psychomotivity and its Essential Attributes. *Carestrelli, L.* . . . 154
A Contribution to the Study of Song. *Gemelli, A.* 161

1. Biochemistry, Physiology, Pathology, etc.

Migraine, its Forms, Causes and Treatment. de Wit, J. C. [*Geneesk Bladen Klin. Lab. Praktijk* (*Haarlem*), **43**, 291 (1949) (*in Dutch*) ; *Excerpta Med., Sect. VIII*, **3**, 397 (1950).]

The pathological and physiological aspects are discussed. Hormones play only a secondary role in migraine. The attacks are attributed to an increased output of cholinesterase (I) which breaks up acetylcholine (II). To abort an attack ergotamine is the best drug. For prophylaxis to prevent attacks, prostigmine (III) (with or without (II) is recommended). (III) inhibits the formation of (I), is well tolerated in prolonged use, and is effective in very small doses.

W. C. Tobie (Chem. Abstr.).

Diagnosis and Localization of Organic Lesions of the Central Nervous System using Radioactive Diiodofluorescein. Davis, L., and Goldstein, S. L. [*Radiology*, **59**, 514 (1952).]

Radioactive diiodofluorescein was used in the study of 536 patients with the diagnosis of an intracranial lesion and observations correlated with the preoperative clinical diagnosis, electroencephalography, pneumography, angiography, and surgical and autopsy observations. The results indicate that this radioactive isotope dye test is a valuable diagnostic adjunct in neurosurgical problems not only because of its high degree of accuracy in determining the presence of brain tumours, but also because of its relatively precise focal localization. The possibility of prognosticating in a general fashion the relative degree of cellularity and vascularity of the tumour also appears to be feasible. Approximately 1·1 millicuries of the radioactive dye contained in a sterile 8 to 10 per cent. solution is injected intravenously, with appropriate radioisotopic precautions to prevent contamination of the skin of the patient and operator. The uptake in the brain is then determined by external counting with the aid of a single-channel differential radiation localizer.

G. L. Clark (Chem. Abstr.).

Lipides and Total Nitrogen in the Central Nervous Tissues of Vertebrates. Mihara, T. [*Kyushu Mem. Med. Sci.*, **3**, 11 (1952) ; *cf. C.A.*, **46**, 9181*b*.]

Cephalin, sphingomyelin, cerebroside, total cholesterol, crude protein and total ash were present in the whole cerebrum in higher concentration in mammals than in lower-class vertebrates, but lecithins, total N and ash were in lower concentration in mammals than in lower-class vertebrates. The distribution pattern of the lipides in the white and grey matter was alike in all species examined. There was no significant difference in the constituents of cerebellum, medulla oblongata and spinal cord among the various species.

J. D. Taylor (Chem. Abstr.).

Permeability in Relation to Nerve Function. (IV) Effect of Glutamate and Aspartate on the Rate of Entrance of Potassium into Brain Cortical Slices. Korey, S. R. [*Biochim. et Biophys. Acta*, **9**, 633 (1952) ; *cf. C.A.*, **46**, 4633*h*.]

Rabbit cortical slices were kept in oxygenated Krebs-Ringer solution for 25 minutes to adjust the cells to the medium, then placed in a solution of the same composition in which part of the K had been replaced by K^{42}. Slices were removed after various times at 23°, washed, plated, dried, and counted. To test the effect of pH slices were pre-exposed in solutions at a given pH for 25 minutes, then incubated for 20 minutes in a solution at the same pH but containing K^{42}. Experiments were also conducted in which 0·03 M L-glutamate or aspartate were added, reducing the concentration of NaCl to maintain isotonicity. Variations in pH from 5·0 to

8·0, and the addition of glutamate or aspartate, did not affect the rate of entry of K^{42} into the cortical cells. Suggestions are presented to explain the lack of effect of the amino-acids on the rate of penetration of K, in view of the work of Krebs.
MORTON PADER (Chem. Abstr.).

The Changes in Cerebral Vascular Resistance of Man in Experimental Alkalosis and Acidosis. Schieve, J. F., and Wilson, W. P. [*J. Clin. Invest.*, **32**, 33 (1953).]

Metabolic acidosis, as produced by giving 3 per cent. $NaHCO_3$ solution intravenously, increases cerebral blood flow (C.B.F.) 65 per cent. above resting normal values. Isotonic bicarbonate solutions (1·2 per cent.) causes a 30 per cent. increase. The increase in C.B.F. after $NaHCO_3$ is not primarily caused by changes in intravascular volume, because an equivalent degree of hemodilution produced by the infusion of NaCl does not produce an increase in C.B.F. Infusion of 2 per cent. NaCl does cause a demonstrable increase in C.B.F. It is not of the order of magnitude produced by the infusion of an equally hypertonic solution of $NaHCO_3$. Intravenous infusion of 0·8 per cent. NH_4Cl reduced the C.B.F. about 20–25 per cent. In the absence of anoxia, cerebral vascular tone is more closely related to total CO_2 content of arterial blood than to arterial pH levels.
JOHN T. MYERS (Chem. Abstr.).

Animal Experiments on the Mechanism of Action of the Blood-brain Barrier. Becker, H., and Quadbeck, G. [*Z. Naturforsch.*, **7B**, 493 (1952).]

Intravenously injected astraviolet FF (I) penetrates the blood-brain barrier some time after death, similar to triphenyltetrazolium chloride (II). In the presence of (II), (I) appears in the brain earlier owing to the acidity generated by the reduction of (II). Permeability is increased by a decrease of the brain pH or an increase of the blood pH. The barrier appears to carry an electric charge, as C_6H_6 soluble dyes penetrate it readily, while C_6H_6 insoluble dyes penetrate only if they can be reduced to C_6H_6 soluble compounds or at a pH where they are partly non-ionic.
ERICH HEFTMANN (Chem. Abstr.).

Investigations of Functional Disturbances in the Blood-brain Barrier in Anoxia and Carbon Monoxide Poisoning with the New Barrier Indicator Astraviolet FF. Becker, H., and Quadbeck, G. [*Z. Naturforsch.*, **7B**, 498 (1952).]

Lowering of the blood-brain barrier by anoxia and CO poisoning could be detected with astraviolet FF (I) or (I) and triphenyltetrazolium chloride before it was indicated by trypan blue. ERICH HEFTMANN (Chem. Abstr.).

Convulsions Viewed from the Isoelectric Point of Cells in the Brain Centres. (II) Examination for the Change in the Isoelectric Point. Yutaka, Hori. [*Osaka Daigaku Igaku Zasshi*, **5**, 49 (1952).]

The isoelectric point (I) of rabbit brain cells was estimated histochemically. Convulsions always accompany suffocation, but suffocation itself does not turn (I) towards the acid side as much as convulsions do. In metrazole (II) convulsions, change in (I) is not proportional to the amount of (II) injected, but is proportional to the intensity of convulsions. I. TYUMA (Chem. Abstr.).

Disturbed Metabolism of Inorganic Compounds in the Brain. (II) Disturbances of Iron and Copper Metabolism. Volland, W. [*Med. Monatsschr.*, **3**, 246 (1949); *Excerpta Med., Sect. VIII*, **3**, 27 (1950).]

The mechanism of deposition of cerebral Fe in dementia paralytica is obscure, the more so as the blood Fe is low in this disease. In hemochromatosis (with high blood Fe) Fe is deposited in the choroid plexus. Cu is connected with pigmentation (especially melanin formation), and is found in rather large amounts in the substantia nigra in man. In Wilson's disease Cu is increased in the liver and in parts of the brain. W. C. TOBIE (Chem. Abstr.).

Metabolism of DL-α-methylglutamate in the Brain. Braganca, B. M., et al. [*Arch. Biochem. Biophys.*, **41**, 478 (1952).]

Under conditions in which glutamine synthesis takes place, NH_3 absorption by DL-α-methylglutamate also occurs with the formation of α-methylglutamine.

DL-α-methylglutamate (0·01 M) inhibits glutaminase activity in brain tissue by 73 per cent. The inhibition is comparable with that brought about by D- and L-glutamate. F. Saunders (Chem. Abstr.).

Histamine in Nerves : III. Werle, E., and Palm, D. [*Biochem. Z.*, **323**, 255 (1952) ; *cf. C.A.*, **44**, 7964*b*.]

Histaminase acts in a diminishing order to destroy histamine, mono- or dimethyl histamine. Antistine in pharmacologically equivalent amounts inhibits to the same degree histamine , mono- or dimethyl-histamine. By means of chromatographic analysis it is now established, thus corroborating previous findings by biological testing, that the substance in the ischiadic nerve or in the stellate ganglion of the cow is identical with histamine, but that neither mono-, di- or trimethyl-histamine is present there. Minute amounts of acetylhistamine are also found in the stellate ganglion or in the lungs, but no methyl derivatives of histamine are found there. Neither histamine nor any derivative has been found in the adrenal glands. No enzyme capable of splitting acetylhistamine is present in aqueous extracts of the stellate ganglion. S. Morgulis (Chem. Abstr.).

Nucleic Acids and other Protein-bound Phosphorus Compounds of Cat Brain. Incorporation of phosphorus ^{32} after an Intracisternal Injection. Strickland, K. P. [*Can. J. Med. Sci.*, **30**, 484 (1952).]

There was a considerable incorporation of P^{32} into the P compounds of cat brain following an intracisternal injection of $P^{32}O_4^{3-}$. The relative specific activities (specific activity of P fraction/specific activity of tissue PO_4^{3-}) determined for a number of P fractions showed that incorporation was most rapid into the acid-soluble P fraction followed in descending order, by phosphoprotein, " diphosphoinositide," pentose nucleic acid, acid-insoluble residue, phospholipides and deoxypentosenucleic acid. The specific activity of the nucleic acids depended on the method of preparation. Richard F. Riley (Chem. Abstr.).

The Oxygen Uptake of Human Cerebral Cortex Slices and the Effects of Some Inhibitors. Elliott, H. W., and Sutherland, V. C. [*J. Cellular Comp. Physiol.*, **40**, 221 (1952).]

The O^2 uptake of brain tissue removed from psychotic patients during prefrontal lobotomy was measured manometrically. In Ringer solution an initial Qo_2 (wet weight basis) of 1·6 decreased to less than 0·8 in 3 hours. Addition of glucose, fructose, galactose, pyruvate or lactate maintained the Qo_2 essentially constant for 3 hours. Addition of succinate increased the initial Qo_2, which then decreased at a rate parallel to that of the endogenous uptake. Mixed amino-acids and glutamic acid, but not alanine, also supported respiration in the absence as well as presence of glucose. The endogenous respiratory quotient (RQ) suggested hexose oxidation followed by utilization of O-rich compounds. With added compounds, only the RQ associated with pyruvate oxidation approached the value calculated for complete oxidation. The RQ associated with the amino-acid mixture suggested utilization of more than 1 component. Inhibition by fluoride, azide and malonate was more effective when they were added at zero time than at 90 minutes. Cyanide, dibucaine and pentobarbital also inhibited respiration. In Ca- free medium endogenous respiration was decreased slightly, but addition of glucose and amino-acids increased respiration. H. L. Mason (Chem. Abstr.).

Effects of Creatinine on the Central Nervous System. II : Anticonvulsant Action. Pfeifer, A. K., et al. [*Acta Physiol. Acad. Sci., Hung.*, **3**, 153–64 (1952) (*in English*) ; *cf. C.A.*, **46**, 1656*a*.]

Prophylactic subcutaneous administration of creatinine (I), 2 mgm./100 gm. to rats in the summer, 10 minutes prior to convulsive doses of pentamethylenetetrazole, protected 50 per cent. of the animals similarly to protection afforded by barbiturates. Increasing dosage of (I) did not improve protection, but administration of 2 mgm. of (I) 2 hours and 10 minutes prior to the convulsant drug increased protection to 75 per cent. In fall or winter (I) exhibited no anticonvulsant action in doses up to 20 mgm./100 gm., but raising the environmental temperature to 28°

(from 18–20°) partially restored the anticonvulsant action of (I). No protection was given by (I) against electrically induced convulsions, but the increased sensitivity to electric convulsions produced by hydration was abolished.

KARL F. URBACH (Chem. Abstr.).

Effects of Glutamic Acid, Sodium Cyanide and Mono-iodoacetic Acid on the Potential Changes of the Isolated Toad Brain. Ebe, M. [*Tohoku, J. Exptl. Med.*, **56**, 3 (1952).]

Spontaneous potential waves (I) had an amplitude of 10–50 mv. and a frequency of 4–5 cycles/sec. When the brain was soaked in 1 per cent. glutamic acid solution, convulsive waves of 100 mv. and 10–20 cycles per second were produced. Alk. Ringer solution caused an increase in amplitude, but acid Ringer solution caused a decrease. High pH caused convulsive waves. NaCN (10^{-5} M) increased, but at 10^{-2} M concentration it abolished (I). Iosoacetate (10^{-5} and 10^{-2} M) abolished (I), but at concentrations of 10^{-3} and 10^{-4} M it increased (I). High concentration of either NaCN or iodoacetate abolished the convulsive effect of glutamic acid.

J. D. TAYLOR (Chem. Abstr.).

Disturbances of Autonomic Regulation after Cerebral Operations. Bernsmeier, A., et al. [*Excepta Med., Sect. VIII*, **4**, 44 (1951).]

Following various operations on the brain, blood sugar responses to insulin and adrenaline and the effects of priscol on the circulation were determined. After removing a hypophyseal adenoma, there was a paradoxical inversion of the adrenaline reaction for 4 days. After operations on the sylvian or the posterior fossa, the insulin-blood sugar curve showed a paradoxical inversion (increased sugar) lasting for 2 weeks. Shifts in water metabolism also occurred.

W. C. TOBIE (Chem. Abstr.).

The Concept of Anticerebral Antibodies in the Etiology of Multiple Sclerosis. Laignel-Lavastine, M., and Koressios, N. T. [*Arch. intern. neurol.*, **68**, 41 (1949); *Excerpta Med., Sect. VIII*, **3**, 32 (1950).]

In multiple sclerosis the blood plasma contains proteins (from the foci of gliosis) which cause the formation of anticerebral antibodies (I) which are γ-globulins. During menstruation large amounts of (I) are released into the blood, causing intensified demyelination.

W. C. TOBIE (Chem. Abstr.).

The Incorporation in vitro of Carbon^{14} into Amino-acids of Control and Virus-infected Mouse Brain. Moldave, K., et al. [*J. Biol. Chem.*, **200**, 357 (1953); *cf. C.A.*, **47**, 2857*f*.]

The incorporation of C^{14} from glucose, acetate, formate, and bicarbonate into the various amino-acids of control and infected 1-day-old mouse brain was investigated. C^{14} from acetate was recovered in glutamic acid, aspartic acid, histidine, alanine, proline, serine and glycine. Propagation of Theiler's GD VII virus (I) inhibited the incorporation of $3C^{14}$ into histidine, but did not markedly affect the other amino-acids. C^{14} from formate was recovered in serine, methionine, histidine, tyrosine plus phenylalanine, cystine, glutamic acid and aspartic acid. In the presence of (I), the incorporation of C^{14} into serine, methionine, tyrosine plus phenylalanine and cystine was stimulated; incorporation into histidine was inhibited; aspartic and glutamic acids were not affected. C^{14} from bicarbonate was recovered in aspartic and glutamic acids only. C^{14} from glucose was converted to all the amino-acids except proline and threonine. Infection with (I) stimulated incorporation into all the amino-acids except histidine and lysine.

F. SAUNDERS (Chem. Abstr.).

Role of Depot Fat in the Hypothalamic Control of Food Intake in the Rat. Kennedy, G. C. [*Proc. Roy. Soc.* (*London*), **B140**, 578–592 (1953).]

The young rat adjusts its food intake so precisely to its energy requirements that its fat stores remain almost constant. Damage to the hypothalamus permits excessive intake and causes obesity. The degree of obesity is a function of the degree of damage to the region of the tuber cinereum.

JOSEPH S. HEPBURN (Chem. Abstr.).

Changes in the Cerebrospinal Fluid during the Treatment of Tuberculous Meningitis with Streptomycin. Marchal, J. G. [*Bull. assoc. diplômés microbiol. fac. pharm. Nancy, No.* **45**, 23 (1951).]

Changes in cells, proteins and chlorides are discussed.

W. C. Tobie (Chem. Abstr.).

Electrophoretic Studies on Cerebrospinal Fluid. Hoch, Hans et al. [*Proc. Soc. Exptl. Biol. Med.*, **81**, 628 (1952).]

A study of 49 patterns of the most frequently encountered type and 16 atypical patterns is reported. A component (X-protein) migrating about 20 per cent. faster than the albumin was demonstrated in every fluid by electrophoresis in phosphate buffer of pH 7·85 and ionic strength 0·05. Another component (X_1) migrating 8–14 per cent. faster than the X-protein was observed in 20 per cent. of the samples. No single component was responsible for the higher protein concentration observed in some of the fluids. A possible relation between the X_1 component and the occurrence of convulsions in some patients was indicated.

L. E. Gilson (Chem. Abstr.).

Differential Rates of Diffusion of Nitrous Oxide into the Cerebrospinal Fluid. Bessman, A. N., et al. [*J. Lab. Clin. Med.*, **40**, 851 (1952).]

Over a 30-minute period N_2O diffused at a more rapid rate into the cisternal fluid than into the lumbar or ventricular cerebrospinal fluids, the latter two showing essentially equal rates. An initial lag was found in the ventricular curve only. N_2O may enter the cerebrospinal fluid *via* routes other than the choroid plexus.

J. D. Taylor (Chem. Abstr.).

Cholinesterase Content of the Brain in Cases of Brain Tumors and Parkinsonism. Weber, G. [*Bull. schweiz. Akad. med. Wiss.*, **8**, 263 (1952) (*in German*).]

In 33 out of 40 brain tumours, cholinesterase was found in the tumour tissue in varying concentrations. In 2 cases of postencephalitic parkinsonism there were no appreciable amounts in the putamen and the globus pallidus, which are usually rich in choline esterase. Dorit L. Noether (Chem. Abstr.).

2. Pharmacology and Treatment.

Cortisone as an Adjunct in the Rehabilitation of the Hemiplegic Patient. Russek, H. I., et al. [*Am. J. Med. Sci.*, **225**, 147 (1953).]

Cortisone (I), administered orally in connection with a programme of training in 26 patients with hemiplegia following a cerebrovascular accident, promoted a sense of well-being, improved motivation, diminished pain, and in some of the patients accelerated the rate of improvement in ability to perform daily functions. Under the conditions of the study (I) did not significantly affect the electrocardiogram, hemogram or blood-pressure, nor did it appear to induce thromboembolic phenomena. Marion Horn Peskin (Chem. Abstr.).

Inhibition of Induced Seizure Potentials by β-hexachlorcyclohexane. Herken, H., et al. [*Experimentia*, **8**, 432 (1952) (*in German*) ; *cf. C.A.*, **45**, 9710*i*.]

Single doses of 150 mgm./kgm. doses in rabbits prevent for many days the development in the electroencephalogram of seizure potentials induced by electric simulation of an epileptogenic brain area. The appearance of metrazole seizure potentials is also prevented. D. S. Farner (Chem. Abstr.).

Anticonvulsant Properties of Apocaffeine. Mercier, J., and Lespagnol, C. [*Compt. rend. soc. biol.*, **146**, 744 (1952).]

When caffeine is treated with HCl plus $KClO_3$ there is formed a bicyclic compound sometimes called apocaffeine, which may be regarded as consisting of 3-methyl-2, 4-oxazolidinedione and 1-methylhydantoin with the number of 5 C atom in common. Although oxazolidinediones and hydantoins are anticonvulsant drugs, apocaffeine has no anticonvulsant activity. L. E. Gilson (Chem. Abstr.).

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(R.) indicates a *Review* ; the title of the book reviewed is followed by the author's name, thus : " Psychoanalysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section ; the title of the abstract is followed by the author's name, thus : " Age and human ability. Miles, W. R. (E.)."

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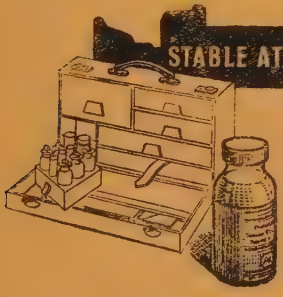

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